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A Distributional Study of the Butterflies of the Sierra De Tuxtla in Veracruz, Mexico.

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A DISTRIBUTIONAL STUDY OF THE BUTTERFLIES OF THE SIERRA DE TUXTLA IN VERACRUZ, MEXICO

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FRONTISPIECE

Section of the south wall of the crater of Volcán Santa Marta. May 1965, 5,100 feet.

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ABSTRACT

The Sierra de Tuxtla is a small and isolated volcanic mountain range along the Gulf coast of southern Veracruz, Mexico. Because of the geographic isolation, the range affords excellent conditions for distributional and ecological investigations. The present study is the first comprehensive report of the butterfly fauna of the range or for any geographic unit within the Neotropics.

Fifteen months (representing all seasons of the year) were spent in the field during 1962, 1963, and 1965. The various relatively widespread plant communities were classified into 16 distinct types or formations. All of these formations were sampled for butterflies and a total of 3,893 specimens representing 359 species, 133 genera, and eight families were collected. Of these species, 40 are recorded from the Sierra for the first time; these include ten range extensions within the state of Veracruz, 18 new state records, nine new national records, three new species, and one new subspecies. All 359 species are listed in the species accounts along with the field data-- complete (number of specimens, locales and altitudes, and collection date) for those species that represent new records for the Sierra but condensed (number of specimens and only ranges in altitude and collection dates) for those species recorded previously from the Sierra.

Various relationships between the butterfly fauna and the environment are discussed. First, an analysis of the plant formations with their indicator and characteristic butterfly species indicates that life zone boundaries within the Sierra are vague but still definable. The Sierra can be divided into two major zones--an Upper Tropical Zone and a Lower Tropical Zone. Furthermore, the data indicate that the Lower Tropical Zone can be subdivided into a humid and an arid component.

Second, the majority of the butterfly species were found in the Lower Tropical Zone in the open and relatively open plant formations whereas very few species (principally members of the Ithomiidae and Satyridae) were found in the dark interiors of the forests. Because of the Sierra's relatively low altitude and relatively uniform rainfall, it is suggested that the principal governing factor determining butterfly areal and altitudinal distributions is the plant formation.

Third, although butterfly zoogeography is not sufficiently advanced to enable one to determine the origins of most genera and species groups, the majority of the genera (97%) and species (97%) found within the Sierra's boundaries appear to have their affinities with forms further south; consequently, the butterfly fauna is essentially Neotropical.

Fourth, although the climate in the Sierra is relatively mild and uniform, enough diversity exists to produce significant variations in the butterfly populations. In general, populations of most species reached maximum densities in late summer and early

fall and their minimum densities in winter and spring. In addition, daily population densities were greatest between the hours of 10:00 A.M. and noon.

Fifth, butterfly endemism proved to be comparable to endemism in other groups; three species, one subspecies, and one form (probably a good subspecies) are endemic to the Sierra de Tuxtla.

I. INTRODUCTION

The Sierra de Tuxtla or Tuxtla Mountains (Tuxtla being the Spanish corruption of the Aztec "Toxtli" meaning rabbit) is a rather restricted highland of volcanic origin situated between 18°10' and 18°45' N latitude and 94°42' and 95°27' W longitude on the Gulf Coastal Plain of the state of Veracruz in the Republic of México (Fig. 1). The range trends northwest-southeast with areal dimensions of approximately 55 by 30 miles and is isolated from any other highland (the nearest being the Sierra Juarez in the state of Oaxaca approximately 90 miles away) by the Veracruz lowlands, principally the drainage basins of the Papaloapan and Coatzacoalcos rivers. The Sierra is composed of numerous ridges and volcanic cones and peaks of which four attain elevations in excess of 3,000 feet, the maximum elevation being 5,450 feet. These volcanic extrusions encircle a central basin containing the picturesque Lago Catemaco, the third largest lake in Mexico (Plate 1).

When man first entered and began to settle the Sierra is still unknown. Sears (1952) states that artifacts dating from approximately 1500 to 500 B.C. and probably Olmec in origin were found in archeological sites in and around the range. The Spanish reached the Sierra a few years subsequent to their arrival in Mexico-- ca. 1522 (Melgarejo Vivanco, 1960). Today the area of

FIGURE 1

Location map of the Sierra de Tuxtla. Map modified from that of Andrle (1964). Basic map used with the permission of the author.

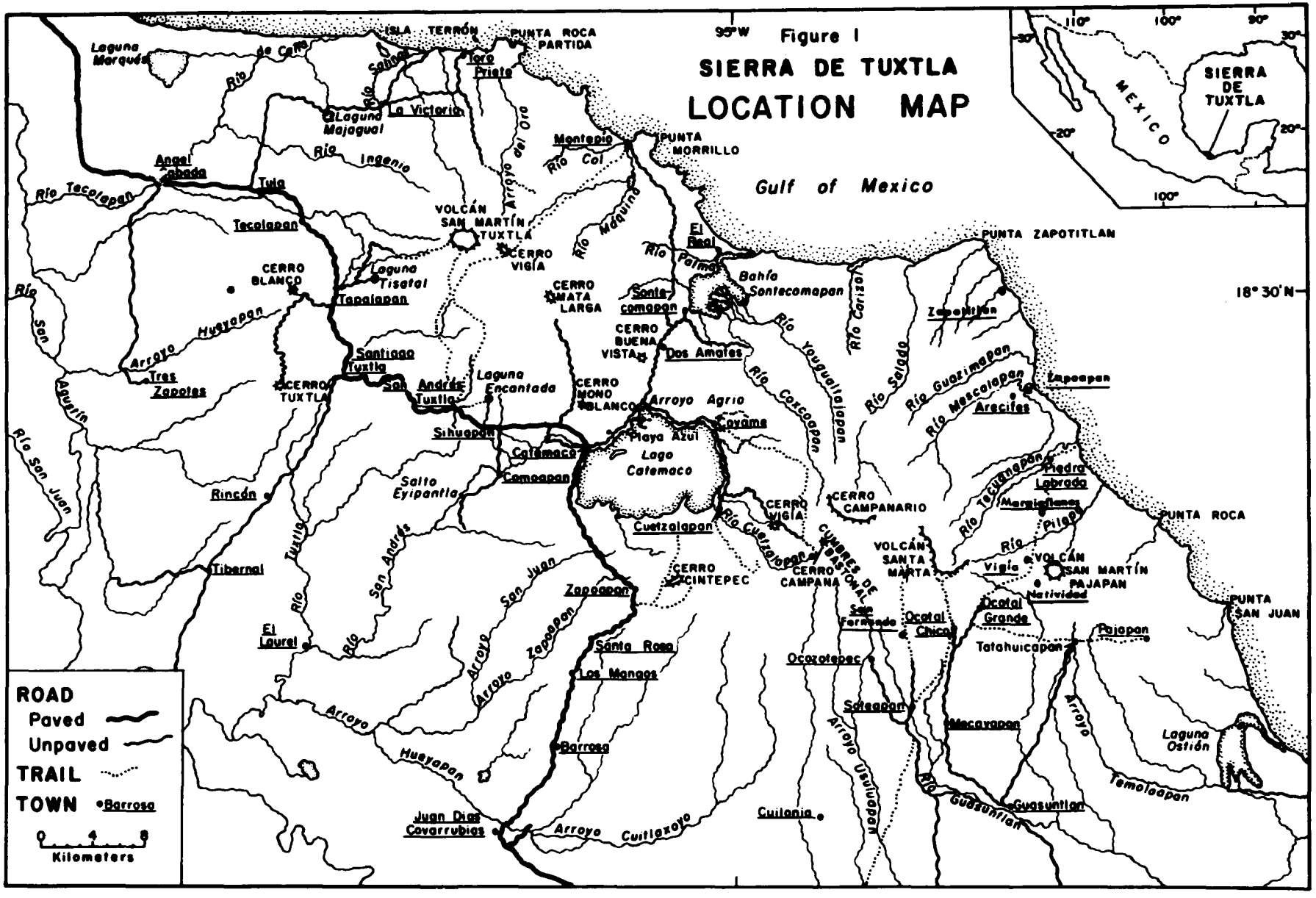
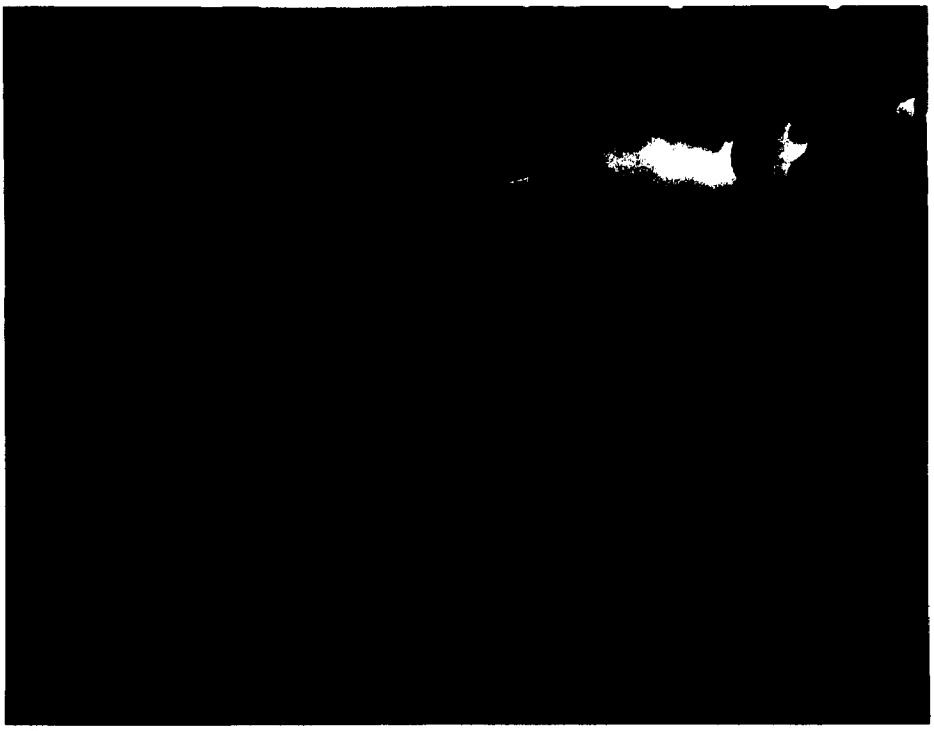


Figure 1
SIERRA DE TUXTLA
LOCATION MAP
95°W
Gulf of Mexico
18° 30'N
MEXICO
SIERRA DE TUXTLA
110°
100°
90°
30°
20°
ISLA TERRÓN
PUNTA ROCA PARTIDA
PUNTA MORRILLO
PUNTA ZAPOTITLAN
PUNTA ROCA
PUNTA SAN JUAN
Laguna Marqués
Río de Cetla
Río Salinas
Toro Prieta
Laguna Majagual
La Victoria
Río Ingenio
Arroyo del Oro
Montepío
Río Col
Angel Cabada
Tula
Río Tecolapan
Tecolapan
VOLCÁN SAN MARTÍN TUXTLA
CERRO VIGÍA
Río Máquina
Río Palma
El Real
Bahía Santecomapan
Río Carisa
Río Salado
Río Yoguallalapan
Río Coxcoapan
Río Guazimapan
Río Mescalapan
Zapoapan
Arecifes
Río Tecuanapan
Piedra Labrada
Morgichapa
Pilapa
CERRO CAMPANARIO
CERRO VIGÍA
CERRO CAMPANA
CUMBRES DE BOSENCHEL
VOLCÁN SANTA MARTA
Río Vigía
VOLCÁN SAN MARTÍN PAJAPAN
Natividad
Ocotal Grande
Ocotal Chico
San Fernando
Pajapan
Tatahuicapan
Ocozotepec
Soteapan
Mecayapan
Laguna Ostión
Arroyo
Temolapan
Río Guasuntlan
Guasuntlan
Cuilonia
Arroyo Usulutlapan
CERRO BLANCO
Laguna Tisatal
Tapalapan
CERRO MATA LARGA
Santecomapan
CERRO BUENA VISTA
Dos Amates
Santiago Tuxtla
Río San Agustín
Arroyo Huayapan
Tres Zapotes
CERRO TUXTLA
San Andrés Tuxtla
Laguna Encantada
CERRO MONO BLANCO
Arroyo Agrio
Cavams
Sihuapan
Catemaco
Playa Azul
Lago Catemaco
Comoapan
Río San Juan
Rincón
Salto Eyipantla
Río Tuxtla
Río San Andrés
Cuetzalapan
Tibernal
El Laurel
Río San Juan
Zapoapan
Arroyo Zapoapan
CERRO CINTEPEC
Santa Rosa
Los Mangos
Barroso
Arroyo Huayapan
Juan Díaz Covarrubias
Arroyo Cuitlazoyo
ROAD
Paved
Unpaved
TRAIL
TOWN
Barroso
0 4 8
Kilometers

PLATE 1

Lago Catemaco, view toward the western margin. August 1962, 1,100 feet. Photograph by R.F. Andrle.



approximately 2,700 square miles is moderately populated with both Mexicans and Indians (Popolucas and Aztecs), the total population in 1960 being approximately 145,000 (Andrle, 1964). The people are engaged mainly in subsistence agriculture, which includes the cultivation of corn, coffee, tobacco, and citrus fruits. Because of the rather long history of settlement and cultivation, relatively few undisturbed areas still exist. These are found principally on the windward (Gulf facing) slopes of the major volcanoes and on the leeward slopes above elevations of 2,500 to 3,000 feet.

Scientific studies in the Sierra have been very limited and brief; biological investigations have been confined almost exclusively to the vertebrate fauna of the Lago Catemaco basin and the slopes of Volcán San Martín Tuxtla. Avian and mammalian studies include those of Sclater (1897), Wetmore (1943), Goldman (1951), Davis (1952), Amadon and Eckelberry (1955), Edwards and Tashian (1959), and Andrle (1964). Herpetological studies include those of Firschen (1950), Firschen and Smith (1956), and Pyburn (1963, 1964, 1966). Previous studies on arthropods are limited to a single paper on opilionids (Goodnight and Goodnight, 1959).

My interest in the Sierra de Tuxtla began in 1961 because of R.F. Andrle, a fellow graduate student who previously had visited the range and who at the time was preparing for a 12 month return visit in early 1962 to study in detail the mammalian and avian faunas. Andrle's enthusiasm about the Sierra coupled with the fact that comprehensive studies on the bionomics of Neotropical butterflies are practically nonexistent, convinced me that the Sierra de Tuxtla

would be an ideal study area for me. So in June 1962 and with Andrle as a field partner, I began my investigation of the Sierra's butterfly fauna. During this first study period (June through mid-December) my main base of operations was located at Playa Azul on Lago Catemaco. From that locale I directed my studies to the Volcán San Martín Tuxtla massif and the Lago Catemaco-Bahía Sontecomapan areas. Two incidental papers (Ross, 1963, 1964b) resulted from this endeavor. The following year, June through August 1963, I made a return visit to the Sierra and established a base at Ocotal Chico. During this period my studies were directed to the Volcán Santa Marta massif. Three incidental papers (Ross, 1964c, 1964d; Hepburn and Ross, 1964) resulted from this study. In 1965 (February through July) I revisited the Ocotal Chico site and expanded my investigation of the region to include the Volcán San Martín Pajapan massif. Once incidental paper resulted from this 1965 trip (Ross, 1966). Transportation during all of the study periods was provided by four-wheel drive vehicles, trucks, mules, power boats, canoes, and my own two feet.

This dissertation is based on an assemblage of 3893 butterfly specimens collected during a total of 15 months of personal field work in the Sierra. In sections II (TOPOGRAPHY AND GEOLOGY) and III (CLIMATE) I have relied heavily on information presented by Andrle (1964) and the reader is referred to that work for additional and more detailed discussions of those topics.

II. TOPOGRAPHY AND GEOLOGY

The Sierra de Tuxtla is an isolated mountain mass dominated by four relatively large volcanoes. To the north these slope rather steeply down to the Gulf of Mexico. To the South, West, and East they slope more gently down to the Gulf Coastal Plain. All slopes are deeply dissected and a radial erosion pattern is very evident. The Sierra can be divided by the basin of Lago Catemaco into a northwest and a southeast massif. The northwest massif is dominated by Volcán San Martín Tuxtla (5,450 feet; Plate 2) and to a lesser extent by Cerro Tuxtla (2,725 feet), Cerro Blanco (2,375 feet), and the elongate Cerro Cintepec (2,950 feet). Numerous small cones, hills, and crater lakes are common south, east, and west of Volcán San Martín Tuxtla. To the north, long, steep-sided ridges radiate down to the Gulf of Mexico. The southeast massif is dominated by Volcán Santa Marta (5,250 feet; Plate 3), Volcán San Martín Pajapan (3,750 feet; Plate 4), and Cerro Campanario (3,900 feet). The southeast section exhibits more uniformity than does the northwest section in the sense that there are very few secondary cones and crater lakes.

The numerous ravines on the slopes of the volcanoes usually contain swift-flowing, clear streams, the flow from many of which is either significantly reduced or stopped during the spring dry season. The streams usually are fed by cool, clear springs that issue from rock crevices on the upper slopes of the volcanoes. At lower

PLATE 2

Volcán San Martín Tuxtla. August 1962, 2,000 feet. Photograph by R.F. Andrle.

PLATE 3

Volcán Santa Marta. Body of water in the foreground is an artificially created reservoir. June 1965, 500 feet.

PLATE 4

Volcán San Martín Pajapan. May 1965, 2,600 feet.

elevations the streams join larger streams and rivers which in turn eventually flow into the Gulf of Mexico.

Murray (1961) states that the Tuxtla Uplift probably existed as early as Mesozoic times. He considers the uplift to be high areas of basement rock in the Mesozoic-Cenozoic geosyncline that probably was part of the arc-shaped "Tamoulipas-Yucatan archipelago." Later, this syncline sank and was subjected to Cretaceous and Tertiary deposits of blue clays and shales, tuffs, sandstones, limestones, and conglomerates, which upon later emergence of the Sierra, were partially eroded away.

Schieferdecker and Tschopp (1922) suggest that the Sierra rests on a diaritic laccolith of early Miocene or Oligocene age that lifted and in places folded the Tertiary beds and from which the volcanic extrusions have emerged. These extrusions comprise most of the present-day Sierra and consist of older Pliocene deposits of an acid andesitic character upon which were superimposed basalt flows and volcanic plugs of late Pliocene age following the last marine inundation.

Andrle (1964) recognized seven principal eruption centers or zones within the Sierra. These are: Cerro Tuxtla, Cerro Blanco, Volcán San Martin Tuxtla, the Lago Catemaco Basin (including Cerros Mono Blanco, Las Animas, and Cintepec), Cerro Campanario, Volcán Santa Marta, and Volcán San Martín Pajapan. Besides these principal cerros, there are numerous subsidiary lava, ash, and cinder cones in the area, principally in the vicinity of Volcán San Martín Tuxtla. The true nature of Lago Catemaco is still debatable. Friedlaender

(1923) considered it to be a caldera but Andrle (1964) suggests that it is simply a spring and stream-filled low section of the range whose southern and western borders are effectively blocked by volcanic cones and debris. Layers of ash, lapilli, and cinders are evident particularly in the Catemaco basin. Basalt bombs, pumice, and asphalt cakes are fairly common, particularly along the coast. Fine-grained olivine basalt rocks are the dominant rock type throughout the Sierra. These are evident as blocks, both large and small, and as extensive flows, which in places exhibit columnar faulting.

Only Volcán San Martín Tuxtla has a historical record of eruptions. This fact tends to support the suggestion of Friedlaender (1923) that the northwest massif is of younger geologic age than the southeast counterpart. Medel & Alvarado (1963) briefly described an eruption on October 15, 1664, which Friedlaender (1923) defined as an ash eruption with a possible restricted lava flow to the north. Mociño (1870) reported a second eruption that began on March 2, 1793 and that consisted of violent explosions, lava flows to the northeast and northwest, and ash falls that continued intermittently through September. Garcia (1835) observed fumarolic activity in the crater in 1829 but nothing more.

The four major volcanoes each show well developed oval and steep-walled craters, which for the most part, are open to the north indicating the direction of major lava flows. The crater of Volcán San Martín Tuxtla has a maximum length of approximately one mile and a maximum depth of approximately 600 feet. The crater of Volcán Santa Marta has a maximum length of approximately one and a half

miles and a maximum depth of approximately 500 feet. Cerro Campanario and Volcán San Martín Pajapan have craters smaller and shallower than those of Volcáns San Martín Tuxtla and Santa Marta.

III. CLIMATE

The Sierra de Tuxtla is characterized by rather uniform year-round temperatures and seasonal rainfall. This rather mild climate is a result of the moderating effect of the Gulf of Mexico. Andrle (1964) lists temperature and precipitation data for six stations in the Sierra. Unfortunately, all of these stations are in a relatively narrow zone on the southern slopes of the Sierra and hence, the data can be used only to illustrate general trends. April and May usually are the warmest months and January and February the coolest. The average annual temperature is approximately 75.5°F (average elevation of 955 feet). The average mean for the coldest month is 68°F. The lowest temperature recorded at any station (San Andrés Tuxtla, 1,188 feet, 32 years of data) was 44.2°F. Medel & Alvarado (1963) reported that on February 9 and 10, 1899, the peak of Volcán San Martín Tuxtla was covered with ice; thus freezing conditions are not unknown on the peaks of the highest volcanoes. Low temperatures usually occur between October and April after the passage of a mass of cold air that moves across the Gulf from the north or northeast. These fronts, which are called "nortes" by the local inhabitants, vary in intensity and duration, some being weak and lasting for only two to three days, others somewhat stronger and lasting for as long as seven days.

Precipitation is variable with two pronounced seasons-- a

wet season from June through January (maximum rainfall in July and October) with usually a slight decrease in August, and a dry season from February through May (minimum rainfall in March and April). Most precipitation during the winter months is associated with the passage of fronts. Most summer and fall precipitation occurs during thundershowers in the night and early morning. Andrle's climatic data indicate that rainfall is principally an orographic type and varies considerably between each station and even from year to year at any single station. The minimal yearly average for any station is 69 inches at Guasuntlan (elevation 595 feet) and the maximal yearly average is 163 inches at Coyame (elevation 1,122 feet). Rainfall above elevations of 1,500 feet on the Gulf slopes is probably in excess of 170 inches per year, and the peaks of the principal volcanoes conceivably receive upwards of 200 inches per year because of the orographic effect.

The cloudiest months are December, January, and July; the least cloudy are March, April, and May.

Since the mean temperature of the coldest month is greater than 64.4°F and the mean precipitation of the driest month is greater than 2.4 inches, the Sierra falls within the "Tropical Rain Forest Climate" (Af) of Köppen (1936).

IV. VEGETATION

The Sierra de Tuxtla lies within (but near the northern border of) the Neotropical Realm of Wallace (1876) and represents the most northern extension of the relatively uninterrupted belt of tropical rain forest that extends (in climatically favorable areas) from southern Mexico through Central America and far into South America (Leopold, 1950; 1959). Hence the floristic composition of the region is basically tropical with most components being related to plant groups further south. This tropical composition coupled with the fact that the Sierra represents a relatively small geographic area (approximately 2,700 square miles) would lead one to the conclusion that the flora of the region is rather homogeneous. Such a conclusion, however, would be completely erroneous because the Sierra exhibits a considerable diversification in vegetation. This diversity is a result of many factors of which some of the most important include: altitudinal zonation from sea level to a maximum elevation of 5,450 feet resulting in temperature and rainfall gradients; differences in the composition and ages of soils due to differential weathering and variances in age of parent material; the long axis of the range in respect to the prevailing winds resulting in relatively heavy precipitation on the Gulf facing slopes and a slight rain shadow effect on the

leeward slopes; and the agricultural practices of man resulting in the presence of all stages of plant succession.

Plant Formations

In attempting to define the habitats of butterfly species in the Sierra, a more subtle ecological division than either "life zone" or "biotic province" had to be chosen. Because of the Sierra's numerous and frequently widely distributed plant communities, I decided to employ a habitat classification based on plant formations.

Andrle (1964) in his investigation of the Sierra differentiated between ten distinct types of vegetation. However, because of the broadness of many of his terms I have found it necessary to modify his classification. This was accomplished by correlating (where possible) the apparent climax types with those as outlined by Beard (1944; 1955). When no correlations were apparent, e.g., the various seral communities and the oak and pine communities, I have errected new categories, being careful not to employ any of the Beard terminology. The result of this effort is that I recognize 16 distinct formations in the Sierra (Table 1). The geographic locations of the major types are illustrated in Figure 2. In actuality the boundaries between each type and the next are rather arbitrary for oftentimes relatively wide transitional zones or ecotones exist between formations.

The analyses of the vegetation in the following discussion are

TABLE 1

PLANT FORMATIONS IN THE SIERRA DE TUXTLA

A. MONTANE FORMATIONS
   (1) Lower Montane Rain Forest (*Terminalia-Dalbergia* Association)
   (2) Montane Rain Forest or Cloud Forest (*Engelhardtia-Quercus* Association)
   (3) *Liquidambar-Quercus* Associes
   (4) Montane Thicket (*Podacarpus-Thouinidium* Association)
   (5) Elfin Woodland (*Quercus-Clusia-Podacarpus* Association)

B. SEASONAL FORMATIONS
   (6) Semi-Evergreen Seasonal Forest (*Bursera-Inga* Association)
   (7) *Bursera-Sabal-Orbignya* Associes

C. SEASONAL-SWAMP FORMATIONS
   (8) Savanna (*Curatella-Byrsonima* Association)
   (9) Deciduous Woodland (*Quercus* Consociation)
   (10) *Pinus-Quercus* Associes

D. DRY EVERGREEN FORMATION
   (11) Littoral Woodland or Dry Evergreen Woodland (*Ficus-Hibiscus* Association)

E. SWAMP FORMATIONS
   (12) Swamp Forest (*Pachira-Ficus* Association)
   (13) Mangrove Woodland (*Rhizophora* Consociation)

F. MISCELLANEOUS FORMATIONS
   (14) Recently Abandoned Milpas
   (15) Pastures
   (16) Hedgerows

FIGURE 2

Vegetation of the Sierra de Tuxtla.

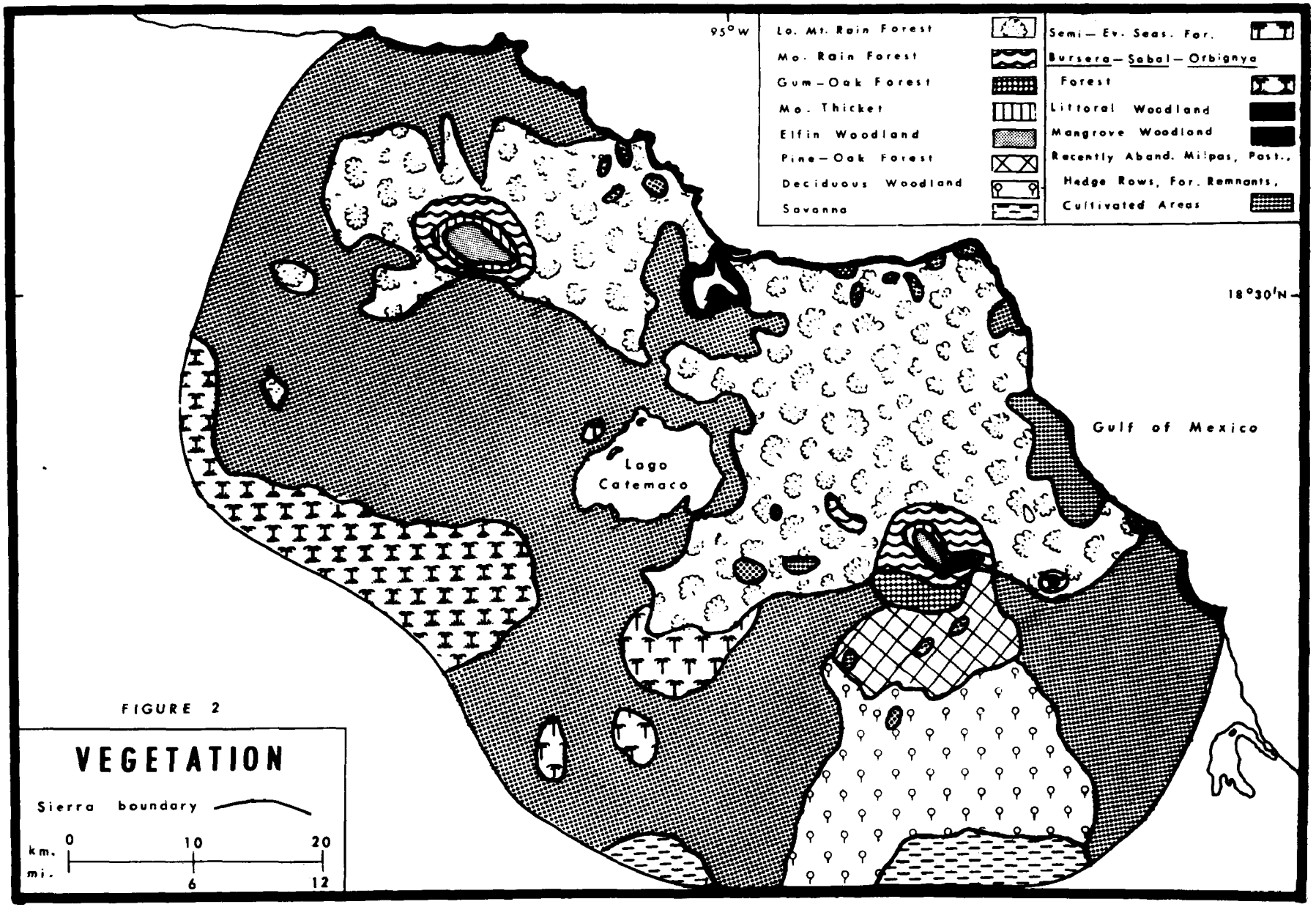

95°W
18°30'N
Lo. Mt. Rain Forest
Mo. Rain Forest
Gum–Oak Forest
Mo. Thicket
Elfin Woodland
Pine–Oak Forest
Deciduous Woodland
Savanna
Semi–Ev. Seas. For.
Bursera–Sabal–Orbignya Forest
Littoral Woodland
Mangrove Woodland
Recently Aband. Milpas, Past., Hedge Rows, For. Remnants,
Cultivated Areas
Lago Catemaco
Gulf of Mexico
VEGETATION
Sierra boundary
km. 0 10 20
mi. 6 12

FIGURE 2

based on samplings by both Andrle and myself. In no instance was an effort made to completely characterize a vegetative type. Usually only the apparently more common members that were either in blossom or fruit were collected. (All plant specimens were donated to the United States National Museum.) Throughout the discussion plant species are listed in descending frequency of abundance. Also, several terms belonging to the science of plant ecology are used, and in order to avoid confusion, are defined below.

1. Dominant-- "those members of the community which exert a controlling influence over the other components" (Beard, 1944). These were chosen empirically according to size and abundance.

2. Association-- "the largest possible group which has consistent dominants" (Beard, 1944). When possible I have tried to characterize the association with the generic names of the two most common dominants. However, in certain instances this limitation could not be imposed so three names had to be employed.

3. Consociation-- "a group of equivalent rank to the association where there is only one clear dominant" (Beard, 1944).

4. Associes-- the major unit of a sere (Clements, 1936), a sere being defined as "any community which is patently in a state of change, development or transition" (Beard, 1944).

MONTANE FORMATIONS

Although Andrle (1964) classified all of the relatively undisturbed and "tall forests" of the range in two categories-- "Rain Forest" and "Cloud Forest"-- he did recognize that the

formations were not homogeneous throughout their extent. My investigations indicate that the diversification within each type is sufficiently pronounced to warrant the formations divisions into subcategories, which can be correlated with the various "Montane Formations" of Beard (1955).

1. Lower Montane Rain Forest (Terminalia-Dalbergia Association); Plate 5.

This formation encompasses the "Rain Forest" of Andrle (1964) and exists principally on the slopes of the major volcanoes. On the Gulf slopes the formation occurs within an altitudinal range of approximately 50 to 3,000 feet. The most extensive areas remaining south of the high long axis of the range are in the vicinity of Cerro Cintepec, the Cumbres de Bastonal, and southwest of Volcán San Martín Tuxtla (Andrle, 1964).

Until five to seven years ago the forest on the Gulf slopes was relatively undisturbed by man. But since then there has been a rather steadily accelerating movement of people from the more densely populated leeward slopes around and onto the Gulf facing slopes. This in turn has resulted in forest destruction so that presently there exist rather extensive (but disjunct) areas that are already cleared or are in the process of being cleared. On the leeward slopes the forest is very much reduced because of several factors. First, because of extensive cultivation involving both corn and coffee, the former occurring in no restricted zone and the latter occurring principally in a zone between 2,300 and 2,900 feet in elevation; second, because of a relatively low annual precipitation due to a rain shadow effect; and third, because of

PLATE 5

Lower Montane Rain Forest near Vigía. May 1965, 1,700 feet.

unfavorable edaphic conditions, particularly on the Santa Marta massif.

Andrle (1964) stated that the "Rain Forest" seems to have its nearest affinities with the "Seasonal Evergreen Forest" of Beard (1944) because of the presence of an understory composed principally of palms and because several of the dominant trees exhibit buttressing. However, as indicated subsequently by Beard (1949), these two characteristics are also shared by the Lower Montane formation but that the critical factors that determine the Lower Montane formation are the presence of only two distinct tree strata and simple leaved dominants, both of which are characteristic of the forests at relatively low elevations in the Sierra. Furthermore, since the three formations that exist on the slopes at higher elevations correlate very well with other subdivisions in Beard's Montane sequence, I conclude that the forests between 50 and 3,000 feet should be considered a typical Lower Montane Rain Forest.

The flora within this formation is very rich. Ground vegetation is relatively sparse and includes Aphelandra aurantiaca and Didymochlaena truncatula (Andrle, 1964). Above this is a zone of saplings and shrubs, which include Hamelia longipes, Myriocarpa longipes, Cephaelis elata (Andrle, 1964), Psychotria sp., and Deherainia smaragdina. Because of the relative sparseness of ground vegetation, walking upright in the formation is not difficult.

The lowest tree stratum ranges between 10 and 18 feet and is composed predominantly of palms-- Astrocaryum mexicanum and Chamaedarea tepejilote being the most common. The dicot Aegiphila costa-

ricensis is also very common.

A distinct middle stratum cannot be differentiated from an upper stratum of emergents. In most cases the tallest trees-- Terminalia amazonia, Dalbergia sp. and Bernoullia flammea, Talauma mexicana, Pithecollobium arboreum, Mirandaceltis monoica, Phoebe mexicana, Engelhardtia guatemalensis, and Virola guatemalensis (Andrle, 1964)-- although ranging from 90 to 110 feet in height, do not protrude significantly above the canopy to warrant the title of emergents. Thus it is best to combine them with the slightly lower species such as Pseudolmedia oxyphyllaria, Stemmadenia galeottiana, Pleuranthodendron mexicana, Calatola sp., Clethra macrophylla, Saurauia sp., Annona sp., Coccolaba sp. (Andrle, 1964), and Rinorea guatemalensis into a single upper stratum or canopy layer that ranges between 70 and 110 feet in height.

Lianas and the climbing fern Dryopteris sp. are common on the trunks of many trees. Epiphytes are relatively uncommon and occur principally in tree crowns.

Within this formation there appears to be a continual shedding of leaves by the component species although there is a heavier leaf fall near the end of the dry season (May). Only Bernoullia flammea was observed to lack leaves for any extended period during the dry season. Also, there appears to be no distinct flowering or fruiting season although flowering, like leaf fall, is more common towards the end of spring.

Where relatively substantial openings exist in the forest, e.g., along logging roads and trails, Boeheria sp. and Urera elata usually

form dense thickets, which attain maximum heights of 8 to 12 feet.

2. Montane Rain Forest or Cloud Forest (Engelhardtia-Quercus Association); Plate 6.

This formation is located above the Lower Montane formation and ranges between approximately 3,000 and 4,100 feet on Volcáns San Martín Tuxtla and Santa Marta but to only 3,500 feet on Volcán San Martín Pajapan because of the latter's slightly lower elevation.

Ground vegetation is similar to that in the Lower Montane formation. Above the ground cover is a zone of saplings and shrubs of which the most common are Cephaelis elata, Chamaedorea ernesti-augustii, Deppea excelsa, Rudgea cornifolia, Engelhardtia mexicana, and Ceratozamia mexicana.

Only two tree strata are present. The lower stratum ranges between 15 and 30 feet and includes Eugenia sp., Chamaedorea elegans, Chamaedorea sp., Eupatorium tuerckheimii, Solanum schlechtendalianum, and Carpinus caroliniana. Tree ferns, Cyathea sp. and Alsophila schiedeana (Andrle, 1964), are very common in the numerous ravines and ridge slopes.

The upper stratum ranges between 50 and 70 feet and includes Engelhardtia mexicana, Quercus skinneri, and Rheedia edulis.

Lianas and epiphytes are more common than in the Lower Montane formation; epiphytes are not restricted to tree boles. Trunks and limbs usually are festooned with mosses, algae, and ferns.

PLATE 6

Montane Rain Forest or Cloud Forest on Volcán Santa Marta.
April 1965, 3,200 feet.

3. Liquidambar-Quercus Associes; Plate 7.

The gum-oak forest, which appears to be a subclimax community, is restricted to a narrow zone on the southern slopes of Volcán Santa Marta between elevations of 2,500 and 3,000 feet. However, both dominants occur sporadically in the Montane Rain Forest on Volcán San Martín Tuxtla and on small isolated hill slopes northeast and northwest of Lago Catemaco.

Ground vegetation is relatively sparse although there is a dense understory of shrubs, bushes, and saplings of which the most common are Cephaelis elata, Siparuna andina, Phoebe bourgeauviana, Erythroxylon tabascense, Hirtella racemosa, Rinorea guatemalensis, Croton glabellus, Rondelitia galeottii, Persea longipes, Machaonia sp., and Casearia sylvestris.

The understory forms a gradient up to the canopy layer that ranges between 30 and 50 feet in height and which consists primarily of Liquidambar styraciflua, Quercus ghiesbrechtii, Belotia sp., Casearia nitida, and Alchornea latifolia.

The gum trees usually drop their leaves in early February and remain leafless for approximately two to three weeks after which time new growth and blossoms appear. The oaks usually do not lose their leaves until late March or early April; new growth and blossoms appear immediately thereafter.

Andrle (1964) suggests that the gum-oak forest exists because of a combination of factors-- destruction of the preexisting vegetation by man, lowered soil fertility from extensive weathering, and rainfall that is slightly lower than that in other sections of

PLATE 7

Gum-oak forest on Volcán Santa Marta. May 1965, 2,700 feet.

the Sierra because of the "broad, high front presented by the south crater walls of Cerro Campanario and Volcán Santa Marta."

Although all three factors probably are operational, it is my opinion that the first two are of greater significance than the third. The Popoluca Indians have been intensively utilizing the area within the present-day gum-oak forest for the cultivation of their corn and coffee for hundreds of years since corn and coffee do not grow well in the pine and oak forests that surround the Indian villages. The corn fields are used only for three to five consecutive years; they then are abandoned and succession is allowed to proceed. Within 20 to 30 years a rather substantial forest of gum and oak becomes established. This is then cut and burned and hence the cycle is begun anew. Very few areas are allowed to proceed beyond the gum-oak community for arable land is at a premium. However, those few areas that remain uncut for longer periods develop a forest that gradually acquires the characteristics of the Montane Rain Forest that occurs presently slightly higher in elevation. Thus, I conclude that intensive agriculture with its inevitable lowering of soil fertility is the primary factor for the existence and maintainance of the Liquidambar-Quercus Associes in the Sierra and that this associes is a subclimax community in the Montane Rain Forest formation.

4. Montane Thicket (Podacarpus-Thouinidium Association); Plate 8.

This formation, which corresponds in part to the "Cloud Forest" of Andrle (1964), occurs between approximately 4,100 and 4,800 feet on Volcáns San Martín Tuxtla and Santa Marta but is

PLATE 8

Montane Thicket on Volcán Santa Marta. April 1965, 4,700 feet.

absent on Volcán San Martín Pajapan. In physiognomy the forest is slightly modified from that described by Beard (1949) inasmuch as there is a distinct and dense understory of shrubs and small trees in addition to the canopy layer. This understory ranges between approximately 15 and 30 feet in height and consists principally of Clethra suaveolens, Oreopanax xalapense, Oreopanax capitatum (?), Xylosma sp. (Andrle, 1964), Engelhardtia mexicana, Ardisia spl, Thouinidium decandrum, Eugenia sp., Deppea excelsa, and Rudgea cornifolia. Tree ferns are uncommon.

The canopy layer ranges between 45 and 60 feet in height and is composed principally of Podocarpus oleifolius, Thouinidium decandrum, and Engelhardtia mexicana.

Tree trunks (usually with no extensive buttressing) and branches support luxuriant growths of mosses, lycopodiums, ferns, bromeliads, and orchids (Elleanthus capitatus being a common species). Lianas are not as common as in the Montane Rain Forest.

The forest on the crests of several of the steep ridges on Volcán Santa Marta has been cut by the Popoluca Indians in order to establish hunting trails up to the crater. In these relatively open areas there is a seral community in which the palms Chamaedorea elegans, Chamaedorea ernesti-augustii, and Chamaedorea sp. predominate and which tends to resemble the "Palm Break" subclimax community of Beard (1944; 1949). However, because of the restricted distribution of this community in the Sierra, I think that the community does not warrant the rank of formation.

This formation (and the succeeding one) frequently are enveloped in clouds caused by the condensation of moist air moving in

on the north and northeast winds from the Gulf. Although mist is more prevalent during the rainy season, there are enough misty days during the dry season to maintain a relatively constant humid condition.

5. Elfin Woodland (Quercus-Clusia-Podacarpus Association); Plate 9.

This formation is the highest in the Montane sequence and is limited to the upper ridges and crater rims and walls of the three principal volcanoes. The forest begins approximately at 4,800 feet on Volcáns San Martín Tuxtla and Santa Marta and at 3,400 feet on Volcán San Martin Pajapan. However, on ridges that are very steep and frequently exposed to strong winds (particularly on Volcán San Martín Pajapan and Cerro Tuxtla), elements of this formation occur at much lower elevations (as low as 2,700 feet). The numerous ravines within this formation contain elements of the Montane Thicket and/or Montane Rain Forest.

Ground vegetation is very luxuriant and consists of a thick mat of mosses and lichens that support profuse numbers of orchids and bromeliads. Where the canopy is relatively open and light penetration is good, grasses, principally Aulonemia sp. and Isachne arundinacea, the sedge Rhynchospora tuerckheimii, and numerous small bushes and shrubs such as Miconia glaberrima, Centropogon affine, and Solanum spp. are common. The fern Gleichenia palmata and the cactus Agave sp. are locally common, especially on open, exposed ridges.

There is but one tree stratum and this consists of a gnarled, interlaced, many branched, and almost impenetrable growth of small

PLATE 9

Elfin Woodland on peak of Volcán Santa Marta. April, 1965, 5,100 feet.

trees ranging between 8 and 20 feet in height and consisting of Quercus ghiesbrechtii, Clusia salvinii, Podacarpus oleifolius, Albizia sp., Phoebe psychotrioides, Ardisia sp. (?), Weinmannia pinnata, Gaultheria sp., Myrica cerifera, Solanum sp., Ceiba pentandra, and Gymnanthes actinostemoides. Andrle (1964) recorded the following additional species: Senecio sp., Hoffmania lenticillata, Viburnum acutifolium, Ilex nitida, Oreopanax xalapense, and Clethra suaveolens.

Practically every branch, limb, and trunk is profusely festooned with mosses, principally Pterobryum densum and Pilotrichella flexilis (Andrle, 1964), ferns, lycopodiums, bromeliads, and orchids, principally Elleanthus capitatus. Many of the topmost branches of the tallest trees are dead. Not all species are evergreen; Albizia sp. (?) remains leafless during the dry season. Flowering and fruiting of all species are most common during the spring dry season.

Landslides resulting from mild earth tremors occasionally occur along the steep walls of the three primary craters (particularly on Volcán Santa Marta). These slides create openings in the forest and produce optimal conditions for primary succession. One of the most common angiosperms to appear shortly after a slide is Schistocarpha sp.

As stated previously, this formation and the Montane Thicket frequently are enveloped in mist, a fact that tends to make insect collecting very difficult.

SEASONAL FORMATIONS

6. Semi-Evergreen Seasonal Forest (Bursera-Inga Association); Plate 10.

This formation corresponds to the "Semi-Deciduous Forest" of Andrle (1964). Because of man's agricultural practices, the forest exists today only as remnants, principally on ridges and slopes in the southern part of the range where annual precipitation is usually less than 70 inches (primarily south of Cerro Cintepec), in the vicinity of Lago Catemaco, and in the numerous ravines within the Deciduous Woodland (including the Pinus-Quercus Associes) on the Santa Marta massif.

Ground vegetation is scanty although there is a dense understory of saplings and herbaceous plants. Common species include Piper spp., Odontonema callistachyum, Acalypha diversifolia, Myriocarpa bifurca, and Heliconia latispatha. The palm Orbignya sp. occurs sporadically throughout the formation.

Two tree strata are present. The lower stratum ranges between 15 and 30 feet in height and is composed principally of Cecropia mexicana, Acalypha diversifolia var. carpinifolia, and Tabernaemontana citrifolia. Along streams Erythrina mexicana is common.

The upper stratum ranges between 40 and 60 feet in height and consists primarily of Bursera simaruba, Inga spuria, Inga leptoloba, Luehea speciosa, Myrcia splendens, Albizia idiopoda, Dendropanax arboreus, Ilex belizensis, and Roupala borealis.

Trees usually branch low and the boles frequently are umbrella-shaped. Buttressing is uncommon. Trunks usually support numerous lianas and vines (such as Anguria tabascensis). Epiphytes are rel-

PLATE 10

Semi-Evergreen Seasonal Forest. TOP, forest near Barrosa. Area in foreground was cut and burned for corn cultivation. June 1962, 500 feet. Photograph from Andrle (1964) and used with the author's permission. BOTTOM, forest in ravine on Volcán Santa Marta near Ocotal Chico. July 1965, 1,700 feet.

atively uncommon.

During the dry season several of the dominants drop their leaves and remain leafless until the onset of the summer rains.

7. Bursera-Sabal-Orbignya Associes; Plate 11.

In the extreme southwest section of the range and at slightly lower elevations than the Semi-Evergreen Seasonal Forest is found a community that appears to be of subclimax rank. This forest is composed principally of Bursera simaruba and the palms Sabal sp. and Orbignya sp. Other trees include Cecropia mexicana, Inga spuria, Cassia spectabilis, and Cassia occidentalis. There is no definite canopy since the trees usually exist in dense, disjunct stands separated by extensive tracts of coarse grasses, sedges, and herbaceous plants of which the most common are Paspalum spp., Sporobolus spp., Rhynchospora spp., Dichromena ciliata, Asclepias woodsoniana, Melanthera angustifolia, and Stemodia durantifolia. These open areas seem to be the result of, and, to be perpetuated by repeated burnings by the local Mexicans and intensive pasturing by livestock.

SEASONAL-SWAMP FORMATIONS

8. Savanna (Curatella-Byrsonima Association); Plate 12.

This formation, which seems to correlate well with the Orchard Savanna of Beard (1953), occupies a rather restricted area in the Sierra, principally south and southwest of the Santa Marta massif and at elevations below 450 feet. The formation intergrades with both the Semi-Evergreen Seasonal Forest and the Deciduous Woodland

PLATE 11

Bursera-Sabal-Orbignya Forest near Tibernal. August 1962, 200 feet. Photograph from Andrle (1964) and used with the author's permission.

PLATE 12

Savanna on Volcán Santa Marta near Guasuntlan. May 1962, 200 feet. Photograph by R.F. Andrle.

where contact exists.

Ground cover within the savanna is of variable density and consists principally of grasses, sedges, and woody plants of which the most common are Paspalum spp., Panicum sp., Dichromena ciliata, Rhynchospora spp., Asclepias woodsoniana, Stemodia durantifolia, and Melanthera angustifolia.

The formation is rather open. Common trees include Curatella americana, Byrsonima crassifolia, Apeiba tibourbou, Quercus oleoides, and Spondias mombin (Andrle, 1964). These attain maximum heights of 10 to 20 feet.

Epiphytes are uncommon. Although leaves of most trees are shed annually (usually at the end of the dry season, May, or after the passage of fire), the trees never remain leafless for any extended length of time.

The reasons for the existence of this formation are debatable as they are for most other tropical savannas. Budowski (1959) states that experimental evidence indicates that all savannas would revert eventually to forest if fire is precluded from the area and if a seed source is near. However, there is not universal agreement on this matter. Beard (1953) states that "savanna may be characterized as the vegetation of the highly mature soils of senile land formations . . . which are subject to unfavorable drainage conditions in the form of intermittent perched water tables, with alternating severe periods of water logging and dessication." Furthermore, he continues and states that although the savanna may be swept by regular fires and the vegetation be adapted as to be

fire resistant, the vegetation is not dependent upon fire for its maintainance but is an edaphic climax.

The Beard hypothesis seems to be the more reasonable explanation for the existence of the savanna in the Sierra. First, the formation occurs in one of the most ancient geological areas in the range (the Santa Marta massif) and the grey to black clay soils probably indicate severe leaching has occurred (Friedlaender, 1923). Second, the land is of low relief and there are numerous outcroppings of bedrock, two factors that probably make drainage relatively inefficient. Third, the annual precipitation, as recorded at Guasuntlan , averages approximately 67 inches and there are at least five months of the year that receive less than four inches of rainfall (Andrle, 1964). Fourth, the area has very few human inhabitants (and probably has had very few in the past) and so man-caused fires are relatively uncommon.

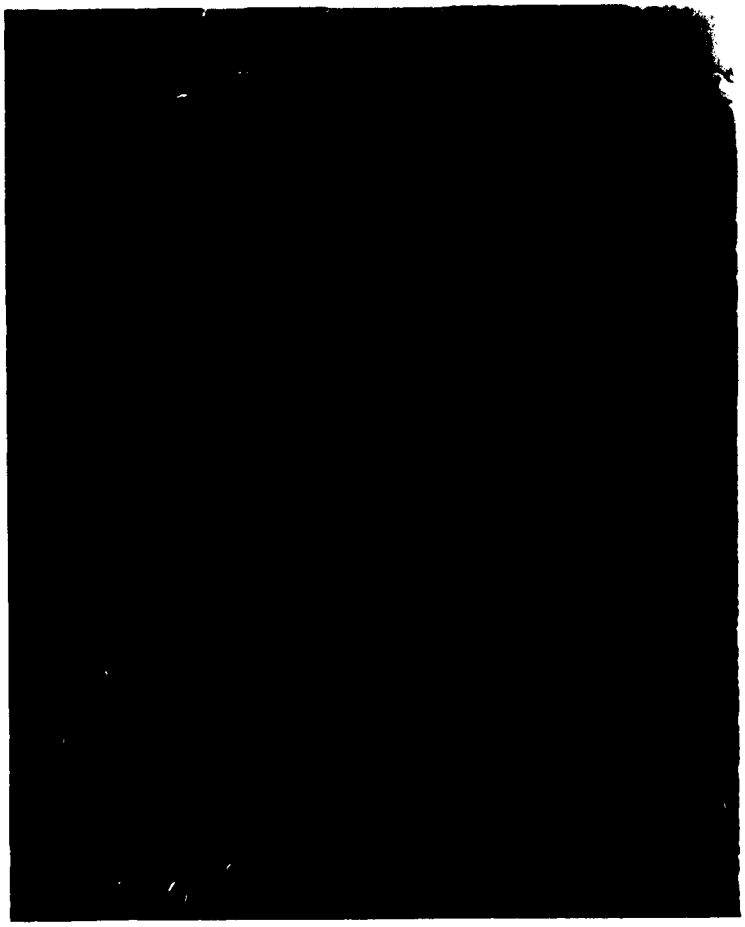
9. Deciduous Woodland (Quercus consociation); Plate 13.

This formation attains its greatest development on the ridges on the southern slopes of Volcán Santa Marta between elevations of 400 and 1,500 feet, i.e., above the Savanna. However, small, disjunct stands are found above the Pinus-Quercus Associes and on the southern slopes of Volcán San Martín Pajapan at elevations between 2,300 and 2,500 feet.

Ground cover is of variable density and consists of short grasses and sedges of which the most common are Eragrostis sp., Rhynchospora globosa, Paspalum pectinatum, Paspalum plicatulum, and Sporobolus cubensis. Oxalis neaei is also common. Dense stands

PLATE 13

Deciduous Woodland on Volcán Santa Marta near Soteapan.
June 1965, 1,700 feet.



of Calliandra grandiflora and Conostegia xalapensis are frequent.

Quercus peduncularis, which attains a maximum height of 30 to 40 feet is the most common species of tree although Quercus oleoides and Quercus ghiesbreghtii are common. Other trees include Byrsonima crassifolia, Miconia argentea, and Acalypha unibracteata.

Towards the end of the dry season (mid-May), most of the oaks drop their leaves and blossom. New growth appears shortly thereafter so that the trees are not leafless for more than one or two weeks.

Epiphytes are fairly common in the taller trees, especially at elevations above 2,000 feet.

This formation appears to be a phase of the Orchard Savanna of Beard (1953) in which species of Quercus predominate. As stated previously, the oak forest exists principally on ridges whereas the Savanna is found on less coarse topography. Therefore, the soils within the oak forest (and which are thin, sandy, and range in color from grey to yellow) probably are more heavily leached and more efficiently drained than those in the Savanna. These two edaphic factors possibly are responsible for the existence of the Deciduous Woodland, which might be termed a modified Orchard Savanna.

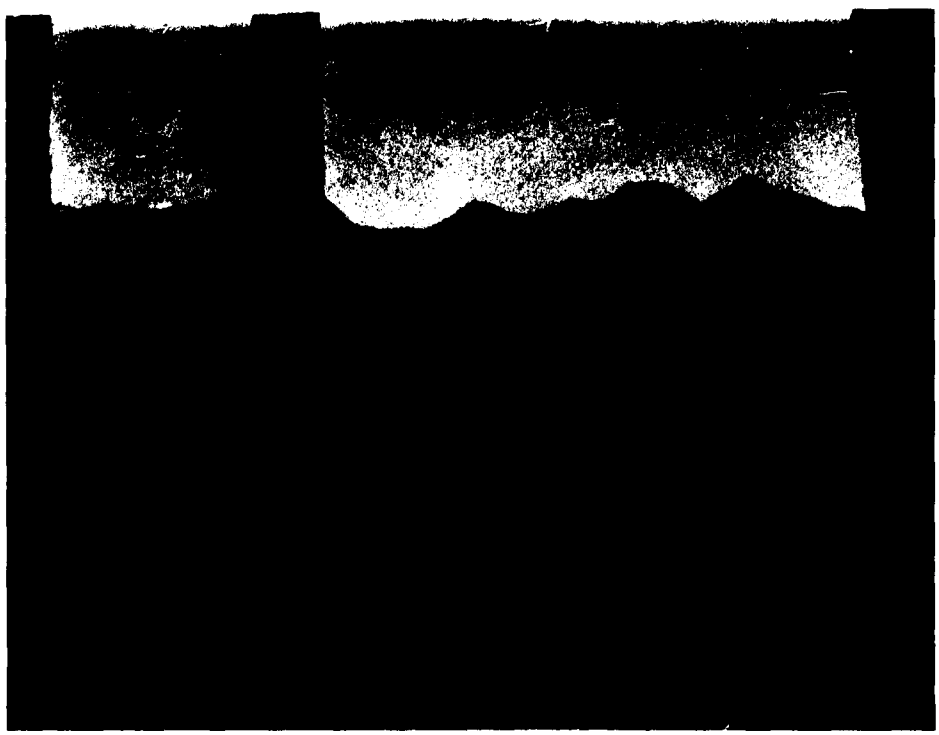
10. Pinus-Quercus Associes; Plate 14.

The pine-oak forest is restricted to a relatively small area on the southern slopes of Volcán Santa Marta. The forest occurs on the upper slopes and crests of many of the numerous ridges between elevations of 1,600 and 3,000 feet.

Ground vegetation is of variable density and consists primarily

PLATE 14

Pine-oak forest on Volcán Santa Marta near Ocotal Chico.
May 1965, 1,900 feet.



of numerous grasses and sedges of which the most common are Paspalum pectinatum, Paspalum plicatulum, Eragrostis sp., Sporobolus cubensis, Rhynchospora globosa, Bulbostylis papillosa, and Dichromena ciliata. Other plants include Croton repens, Borreria suaveolens, Crusea calcocephala, Calliandra grandiflora, Eupatorium incomptum, Calea zacatechichi, Ruellia fluviatilis, Stevia rhombifolia, Cordia spinescens, Lamourouxia viscosa, Conyza chilensis, Escobedia laevis, Turnera ulmifolia, Calea longipedicellata, Cassia hispidula, Vernonia leiocarpa, Salvia shannonii, Calea cacosmoides (?), and Vernonia argyropappa. The cycad Zamia loddigesii is locally common.

Pinus oocarpa is the dominant tree species although Quercus conspersa and Quercus ghiesbrechtii occur rather commonly throughout the formation. Trees never form dense thickets or forests but are relatively widely distributed in open stands.

The pine-oak community represents one of the most interesting curiosities and enigmas of the Sierra de Tuxtla for the formation has such a restricted distribution. The nearest comparable formation occurs in the Department of Tuxtepec, Oaxaca, 90 miles away. The Sierra's Pinus-Quercus community appears to be a subclimax community, which probably corresponds to the "Pine Savanna" of Beard (1953) and which is considered by that author to be a phase of the "Orchard Savanna." Beard states that pines may and usually do invade savannas when a seed source is near. However, in the Sierra pines do not occur in either the typical Savanna or the Deciduous Woodland (modified savanna), formations that exist in areas more proximal to the pine seed source in Oaxaca. Hence,

additional factors probably are responsible for the limited extent of the pine-oak community. Two suggestions are offered. First, the community exists only on the crests of steep ridges, areas in which soils are extremely thin and lateritic (Friedlaender, 1923) and hence relatively poor in nutrients. Furthermore, most of the Sierra has been settled by Indians-- relatively recently by Popolucas and Aztecs and formerly by Olmecs-- for over 2,000 years (see Ross, 1966). Today most of the Indian villages on the Santa Marta massif are restricted to ridge crests and information gathered from Popolucan legends and stories indicates that this pattern of settlement is an ancient one. Thus the ridge crests have been subjected to severe soil disturbances for at least hundreds of years. Numerous works, e.g., those of Pessin (1937), Stoate (1950), and Merrifield, Foil, and Hansbrough (1964), have shown that pines can grow well in soils with relatively low concentrations of nutrients and which are too poor for many plant species. Therefore, I conclude that the ridge crests represent a favorable habitat for pines and a relatively unfavorable one for many (or even most) other species of trees. Second, the Popolucas today engage (and have engaged for hundreds of years) in annual burnings of the pine lands. These burnings significantly increase the geographic extent of the pine-oak community for whenever fire is excluded from an area for several consecutive years a heavy ground cover consisting of numerous grasses, shrubs, and oak saplings develops. These saplings develop later into trees; pine seedlings usually are never present (Ross, 1966). Therefore, I conclude that the pine-

oak community in the Santa Marta area is a seral stage within the Deciduous Woodland (which in turn is a modified savanna) and which has become established because of favorable edaphic conditions and is being maintained in its present extent by man-caused fires.

The ravines within the Pinus-Quercus Associes contain elements of the Semi-Evergreen Seasonal Forest.

DRY EVERGREEN FORMATION

11. Littoral Woodland or Dry Evergreen Woodland (Ficus-Hibiscus Association); Plate 15.

This formation occurs along the seashore between the high water mark and the volcanic headlands fronting the Gulf. Hence the formation is variable in width, extending inland for only a few feet or to 500 to 1,000 feet. Strong winds and salt spray are common throughout.

Along the sandy beaches the following plant species are common: Cyperus ligularis, Cyperus articulatus, Cenchrus incertus, Distichlis spicata or Sporobolus virginicus, Chloris petraea, Vigna luteola, Ipomoea stolonifera, and Ipomoea pes-caprae.

Farther inland are small, gnarled, and windswept trees and shrubs, which are found both in small open patches and in extensive dense thickets. These woody species include Ficus spp., Hibiscus tiliaceous, Pachira aquatica, and Piper cordovan.

SWAMP FORMATIONS

12. Swamp Forest (Pachira-Ficus Association); Plate 16.

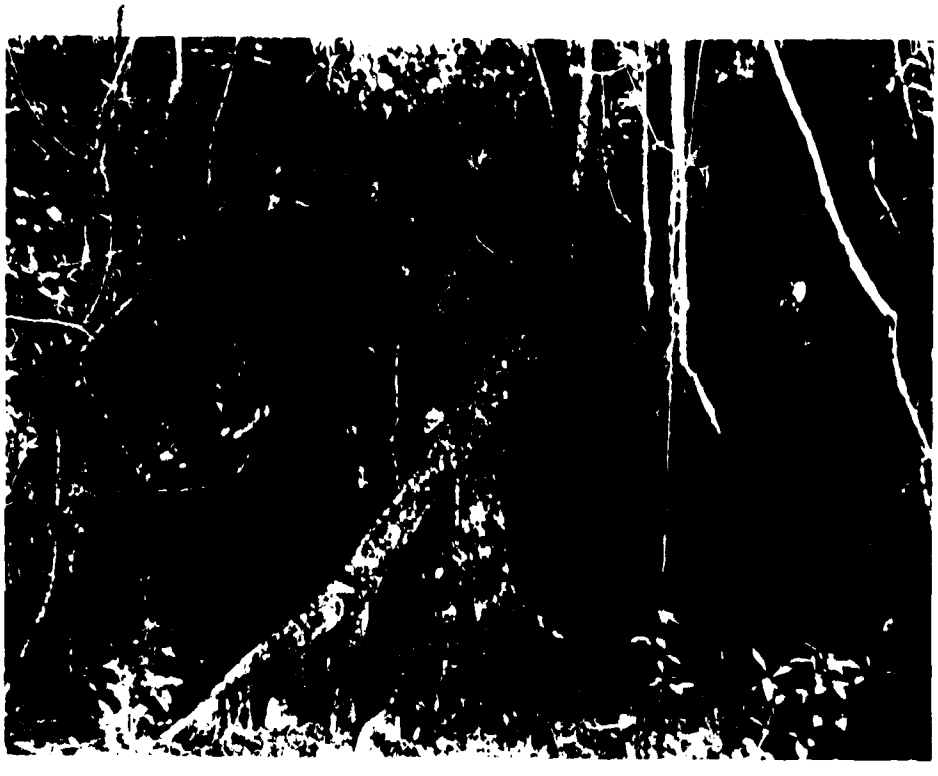
The Swamp Forest is located at low elevations near the Gulf

PLATE 15

Littoral Woodland near Zapoapan; view is towards the south-east. May 1965, sea level.

PLATE 16

Swamp Forest near Zapoapan. May 1965, sea level.



and bordering several of the large streams, e.g., Río Zapoapan, Río Carizal, Río Salado, Río Yougualtajapan, and Río Máquina. The ground in this formation is waterlogged during most of the year and is frequently inundated for long periods during the rainy season.

The understory is relatively open and is composed principally of Chamaedorea tepejilote, Piper cordovan, and numerous saplings.

The single tree stratum ranges between 40 and 60 feet in height and is composed principally of Pachira aquatica, Ficus spp. (including Ficus obtusifolia), Hibiscus tiliaceous, and Pleuranthodendron mexicana.

Many trees exhibit buttressing and stilting. Lianas and epiphytes are common.

13. Mangrove Woodland (Rhizophora consociation); Plate 17.

This formation is restricted to the margins of Bahía Sontecomapan. Rhizophora mangle is the only principal species and forms thick, closed stands up to 40 or 60 feet in height. Stilt roots and pneumatophores are common.

UNRESTRICTED MISCELLANEOUS FORMATIONS

14. Recently Abandoned Milpas; Plate 18.

When a milpa or corn field is abandoned the field is invaded by numerous grasses and annuals. The latter include Melampodium divaricatum and Ageratum conyzoides, both of which blossom in the spring and which are replaced in the summer by Baltimora recta, Bidens pilosa var. bimucronata, and Melampodium kunthianum. In

PLATE 17

Mangrove Woodland along Bahía Sontecomapan. May 1962, sea level. Photograph by R.F. Andrle.

PLATE 18

Recently Abandoned Milpa on Volcán San Martín Tuxtla. Field has remainded fallow for approximately one year. June 1962, 2,350 feet. Photograph by R.F. Andrle.

subsequent years these species usually are replaced by more woody plants such as Polymnia maculata, Cordia spinescens, Hamelia patens, Piper auritum, Conostegia xalapensis (Andrle, 1964), Heliotropium indicum, Calliandra grandiflora, and Vernonia leiocarpa.

15. Pastures; Plate 19.

Areas that are used consistently for the grazing of cattle and/or horses usually develop rather distinctive floristic characteristics. There are numerous patches or clumps of relatively short vegetation composed of Cordia alliodora, Croton soliman, Picramnia andicola, Heliotropium indicum, Crotalaria vitellina, Urera elata, Solanum ochraceo-ferrugineum, and Piper auritum. Trees, which are relatively few in number, include Inga spuria, Inga leptoloba, Cassia spectabilis, Cassia occidentalis, Annona reticulata, Annona muricata, Trema micrantha, and Pleuranthodendron mexicana.

16. Hedgerows; Plate 20.

Corn fields and pastures in the more heavily cultivated sections of the Sierra, e.g., in the vicinity of the larger cities and towns, usually are bordered by fences about which is found a varied but characteristic assemblage of plants. Where best developed these rows may be as wide as 15 to 20 feet. The undergrowth usually is a tangle of vegetation composed of Cordia spinescens, Urera elata, Passiflora serratifolia, and Passiflora coriacea. Tree species attain maximum heights of 20 to 30 feet and include Bursera simaruba, Gliricidia sepium, Erythrina americana (Andrle,

PLATE 19

Pasture near Zapoapan. May 1965, sea level.

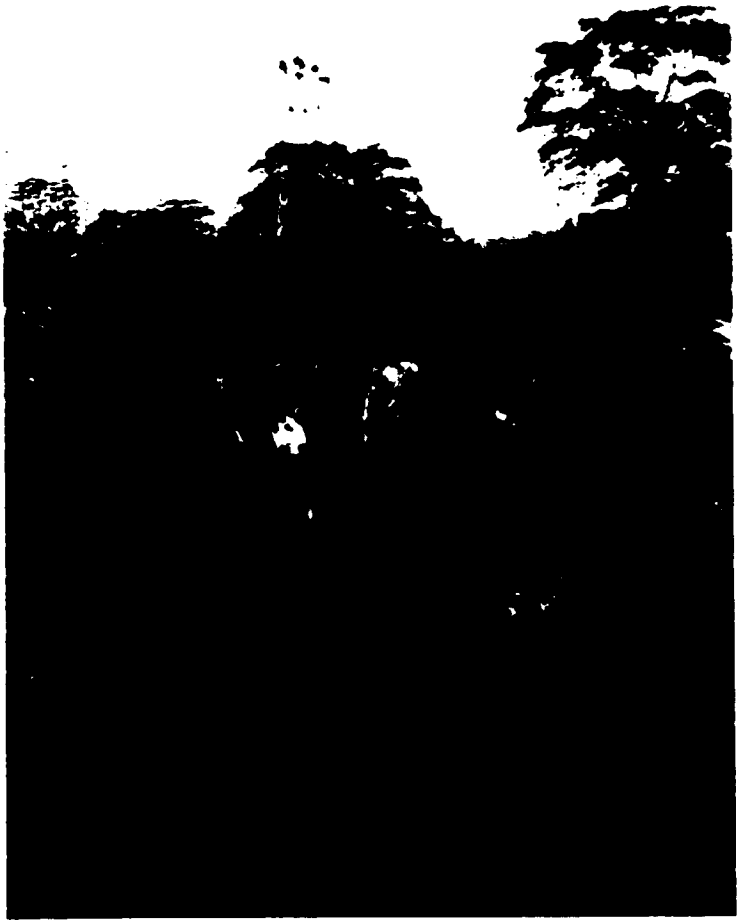
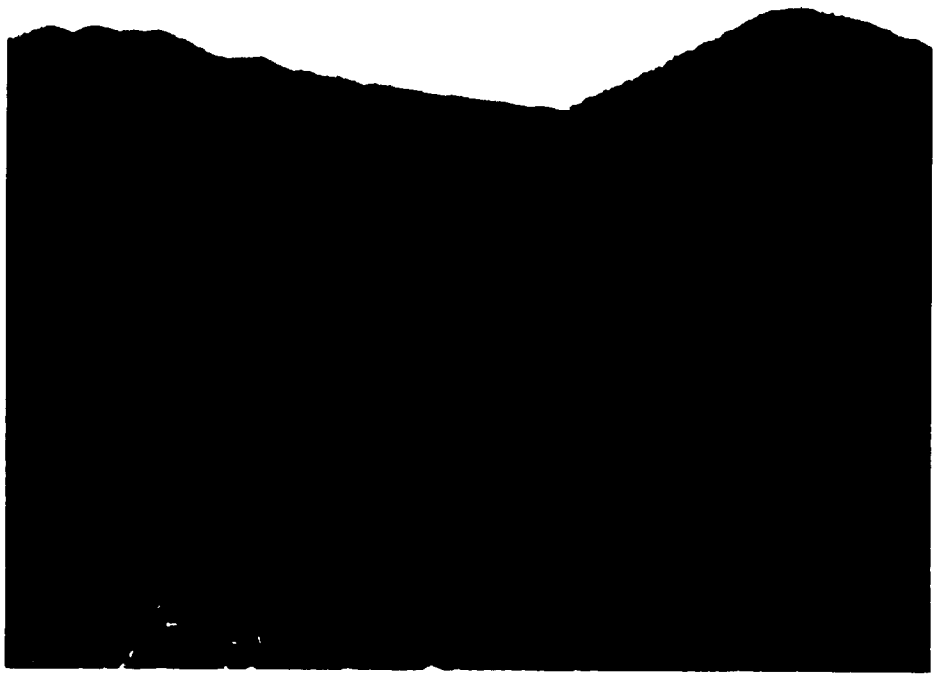


PLATE 20

Hedgerow near San Andrés Tuxtla. Although the predominant tree in the photograph is Bursera simaruba, numerous other species of trees and shrubs usually are present. June 1962, 1,300 feet. Photograph by R.F. Andrle.



1964), Zanthoxylum elephantiasis, Ficus padifolia, Inga spuria, Inga leptoloba, Cassia spectabilis, Annona muricata, and Annona reticulata.

V. ACCOUNTS OF BUTTERFLY SPECIES IN THE SIERRA DE TUXTLA

Plan of the Species Accounts

Unfortunately, systematics of the Lepidoptera, especially tropical forms, is in a relatively unstable state. Indeed, between one-third and one-half of the species listed in the "Catalogo Sistematico y Zoogeografico de los Lepidopteros Mexicanos" (Hoffmann, 1940) do not bear today the same generic and specific names. For this reason I have had to rely on numerous and isolated taxonomic works in addition to personal correspondence in order to present here a reasonably accurate and modern systematic arrangement of taxons. In particular, I have followed Munroe and Ehrlich (1960) for the arrangement of the Papilionidae, Klots (1931) for the Pieridae, Fox (1956) for the Ithomiidae, Michener (1942) and Emsley (1963) for the Heliconiinae (Nymphalidae), Forbes (1944) and Higgins (1960) for the Argyniididi (Nymphalidae), Chermock (1950) for the Liminitidi (Nymphalidae), and Clench (1955) for the Lycaenidae and Riodinidae. Thus, it is hope that this paper, although not intended to be taxonomically oriented, nevertheless will represent a significant contribution to the systematic literature and serve as a modern reference for students of Neotropical Lepidoptera.

Each species account is introduced by the scientific name of the species. Following this heading and under the caption SPECIMEN or SPECIMENS are the field data. For those species that previously have been recorded from the Sierra, the data have been condensed and include number of specimens of each sex, maximum-minimum altitudes (elevations were measured with a Taylor "Forecaster-Altimeter" calibrated to measure in 200 foot intervals), and earliest-latest collection dates. For those species that represent new records for the Sierra or which are rare, the complete field data are given (mileages represent straight-line distances). If a particular specimen is in a collection other than my own, initials of the collection are included. The following initials are employed: KHW=personal collection of Kent H. Wilson and LSUMZ=Louisiana State University Museum of Zoology. Sequence of entries is determined primarily by altitude (lowest elevation listed first) and secondarily by collection date (the earliest day and month listed first). Thus, the first and last entries give the altitudinal range of the species.

Following the data is a discussion paragraph. In the first sentence I express the relative abundance of the species in the Sierra by employing four general terms-- abundant, common, uncommon, and rare. I consider a species to be abundant if ten or more individuals of it were noted every (or almost every) day, common when less than ten individuals were noted each day, and uncommon when only three to five individuals were seen at fairly wide intervals of time. Those species collected only after very long time lapses or only once or twice during my residence are designated as rare.

Unfortunately, these terms are extremely difficult to standardize when referring to animals in the tropics because of the overwhelming array of inconspicuous and virtually uncollectible habitats. Therefore, in many cases the evaluation of the relative abundance of a species may be very biased and not reflect the actual status of the species. In the second sentence (and frequently in the latter part of the first) I give the principal plant formation or formations inhabited by the species. Sequence of formations is based on decreasing relative abundance of the butterfly species. The remaining sentences are devoted to general comments, principally on the ecology and ethology of the species, that I consider pertinent. When a species previously has not been recorded from the Sierra, the nearest recorded locale is given in the last sentence of the paragraph.

Accounts

FAMILY PAPILIONIDAE

SUBFAMILY Papilioninae

TRIBE Graphiini

SUBTRIBE Graphiiti

1. Graphium phaon (Boisduval)

SPECIMENS: 10♂♂, 1♀; 1,100-1,800 feet; 12 May-3 Oct.

This species is common along Hedgerows, particularly in the vicinity of Lago Catemaco. Most butterflies were collected as they imbibed moisture from wet sand and soil. The flight is relatively rapid, erratic, and usually between two and four feet of the ground. Two of the 11 specimens collected exhibit a loss of marginal and submarginal greenish dots on the dorsal fore wings and a replacement of the postmedian--median row of greenish scales on the dorsal hind wings with red scales. This morphotype, which has been named form eridamas (Reakirt), bears a close resemblance to Parides polyzelus (Papilioninae:Troidini), a species that is abundant along hedgerows and the margins of forests.

2. Graphium branchus (Doubleday)

SPECIMENS: 3♂♂; 2 mi. NE Catemaco, 1,100 feet, 27 July 1962, 1♂; 3 Aug. 1962, 1♂: Ocotal Grande, 1,800 feet, 15 May 1965, 1♂.

This tailless Graphium is uncommon and was collected along the margins of the Semi-Evergreen Seasonal Forest only in late spring and summer. The flight is relatively close to the ground (usually within three or four feet) and similar in velocity to that of Parides spp. This species was recorded previously from

Veracruz only from the "Sierra Madre Oriental" (Hoffmann, 1940).

3. Graphium belesis (Bates)

SPECIMENS: 18♂♂, 6♀♀; 1.5 mi. SSE Sontecomapan, 900 feet, 14 July 1962, 1♀: 2 mi. NE Catemaco, 1,100 feet, 1 July 1963, 1♂; 2 July 1962, 1♀; 9 July 1962, 1♀ (KHW); 27 July 1962, 2♂♂ (1 KHW); 9 Aug. 1962, 1♂; 31 Aug. 1962, 1♂; 8 Sept. 1962, 1♀: 4.5 mi. NE Catemaco, 1,100 feet, 26 June 1962, 1♂: 4 mi. S Coyame, 1,200 feet, 25 June 1962, 3♂♂: 2.5 mi. SW Sontecomapan, 1,300 feet, 26 June 1962, 1♂: 1 mi. N Soteapan, 1,400 feet, 28 March 1965, 1♂; 29 March 1965, 2♂♂: 1 mi. SSW Vigía, 1,800 feet, 18-March 1965, 1♀: 1 mi. NNE Ocotal Chico, 2,000 feet, 1♂, 1♀: 2 mi. NNW Ocotal Chico, 3,800 feet, 1♂. Reared specimens: 2 mi. NE Catemaco, 1,100 feet, emerged 30 July 1962, 1♂ (KHW); emerged 3 Sept. 1962, 1♂; emerged 6 Sept. 1962, 1♂.

This species is abundant during the spring and summer months along the margins of the Semi-Evergreen Seasonal Forest and Hedgerows, particularly in the vicinity of Lago Catemaco. Adults are attracted to wet sand and soil. The flight is usually slow and within three feet of the ground, a behavior that is atypical for most members of the genus. Of the 24 specimens collected, two have faint white blotches on their dorsal fore wings. This morphotype, named form hephaestion (Felder), bears a close resemblance to females of Parides spp. Larvae (described in Ross, 1964b) were found occasionally on Annona muricata, a tree called "Guanabana" by the local residents and commonly planted around habitations. G. belesis was recorded previously from Veracruz only from the "Sierra Madre Oriental" (Hoffmann, 1940).

4. Graphium philolaus (Boisduval)

SPECIMENS: 3♂♂, 1♀; 1,100-1,200 feet; 20, 27 June.

Although only four specimens were taken, the species is com-

mon during the spring and early summer months in Pastures and along sunny road sides in the vicinity of Lago Catemaco. The butterflies are attracted to moist earth and to the flowers of Inga leptoloba, a tree common in pastures. G. philolaus exhibits the high, soaring flight that is characteristic of most species in the genus.

5. Graphium epidaus epidaus (Doubleday, Westwood, & Hewitson)

SPECIMENS: 1♂, 3♀♀; 1,100 feet; 20 June-27 July.

Adults are very abundant during the spring and summer months in Pastures, Recently Abandoned Milpas, and along Hedgerows and sunny road sides throughout the Sierra but particularly in the vicinity of Lago Catemaco. This distribution correlates with the distribution of the larval food plant Annona reticulata, a tree that produces sweet fruit and which is cultivated frequently by the local inhabitants. Adults exhibit the characteristic Graphium flight and are attracted to mud puddles and damp soil and sand. Immature stages (described in Ross, 1964b) were found commonly on the leaves of the food plant during the summer months.

6. Graphium agesilaus neosilaus (Hoffer)

SPECIMENS: 4♂♂; 2 mi. NE Catemaco, 1,100 feet, 2 July 1962, 2♂♂: 1 mi. N Soteapan, 1,400 feet, 28 March 1965, 2♂♂.

This "kite swallowtail" is uncommon and was collected only along sunny road sides during spring and early summer. All four specimens were taken as they drank from damp sand. The previous Veracruz record is the "Sierra Madre Oriental" (Hoffmann, 1940).

7. Graphium calliste calliste (Bates)

SPECIMENS: 16♂♂, 1♀; 4,100-5,100 feet; 3 March-7 April

G. c. calliste is abundant above the canopies of the Montane Thicket and Elfin Woodland during March and April. The butterflies descend to within a few feet of the ground usually only to visit flowers, particularly those of Schistocarpha sp. (a composite that is common on the open, sunny ridges and crater walls).

TRIBE Troidini

SUBTRIBE Battiti

8. Battus polydamas (Linnaeus)

SPECIMENS: 6♂♂, 4♀♀; 0-2,700 feet; 10 March-14 Aug.

B. polydamas is abundant in the Littoral Woodland and common in all other formations except the Montane series. Adults are attracted to the flowers of Lantana camara and to moist soil and sand. The flight is relatively rapid and usually within eight feet of the ground. When pinched, specimens protruded their yellowish abdominal scent glands, which emitted an acrid odor. Larvae were found on Aristolochia asclepiadifolia, a vine that is common in the vicinity of the Popoluca Indian villages on the Santa Marta massif.

9. Battus belus varus (Kollar)

SPECIMENS: 4♀♀; 700-1,400 feet; 20 May-14 July.

This papilionid is locally common, being seen most frequently

along the margins of the Semi-Evergreen Seasonal Forest in the ravines within the oak and pine-oak forests. The flight usually is above ten feet of the ground. Two of the four specimens were taken as they fed on the blossoms of Inga spuria. The abdominal scent glands produce an acrid odor.

10. Battus laodamas copanae (Reakirt)

SPECIMENS: 1♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 24 June 1962, 1♀; 28 June 1962, 1♂.

This rare species was collected only in Pastures; the female as it fed on the blossoms of Lantana camara and the male as it flew about the blossoms of Inga spuria. The flight is relatively rapid and erratic.

SUBTRIBE Troiditi

11. Parides photinus (Doubleday)

SPECIMENS: 8♂♂, 5♀♀; 700-5,100 feet; 30 March-30 Aug.

This species is common in all the Montane Formations and the Semi-Evergreen Seasonal Forest on the Santa Marta massif. The butterflies are particularly numerous along sunny trails and in bright glades with the forests. The flight is relatively slow and usually within four feet of the ground. However, when individuals are disturbed they fly rapidly with powerful wing beats. The abdominal scent glands emitted an acrid odor when the butterflies were pinched. The larval food plant is Aristolochia asclepiadifolia, the same as that of Battus polydamas. Immature stages are described elsewhere (Ross, 1964d).

12. Parides montezuma (Westwood)

SPECIMENS: 4♂♂; 1,050-2,000 feet; 1 Aug.-29 Oct.

This tailed Parides is locally common, being found most frequently in the Recently Abandoned Milpas surrounding the Indian villages of Mecayapan and San Fernando. The butterflies fly fairly rapidly between four and ten feet of the ground and are attracted to flowers. The abdominal scent glands produce an acrid odor.

13. Parides polyzelus polyzelus (Felder)

SPECIMENS: 21♂♂, 6♀♀; 0-1,900 feet; 13 March-5 Oct.

This papilionid is abundant in the Semi-Evergreen Seasonal Forest, Lower Montane Rain Forest, Littoral Woodland, Swamp Forest, and along Hedgerows. In fact, this species is the most common forest-inhabiting swallowtail. The flight is relatively slow, weak, and usually within three or four feet of the ground. The abdominal scent glands produce acrid odors.

14. Parides sesostris zestos (Gray)

SPECIMENS: 4♂♂, 1♀; 0-1,750 feet; 12 July-29 Oct.

This swallowtail is locally common, being found in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, Littoral Woodland, and Swamp Forest. It and the following two species, P. iphidamas and P. arcas mylotes, in addition to being very similar in appearance, seem to be very closely related ecologically and ethologically. For example, all three species prefer the relatively bright or sunlit sections of mature forests below an ele-

vation of approximately 3,000 feet and usually are found in localized assemblages. The flight is rapid and within three to five feet of the ground. As reported in Ross (1964a), the butterflies appear to have definite "flyways" from which they very rarely deviate. These flyways usually are sections of relatively wide trails. The abdominal scent glands produce an acrid odor.

15. Parides iphidamas (Fabricius)

SPECIMENS: 16♂♂, 9♀♀; 0-2,450 feet; 13 March-18 Oct.

This species is locally common (more common than P. sesostris zestos) in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, Littoral Woodland, and Swamp Forest. The flight behavior is the same as that of P. sesostris zestos. The abdominal scent glands, as those of other members of the genus, produce an acrid odor.

16. Parides arcas mylotes (Bates)

SPECIMENS: 17♂♂, 13♀♀; 0-2,700 feet; 13 March-24 Oct.

P. arcas mylotes is locally abundant in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, Littoral Woodland, and Swamp Forest. The flight behavior is the same as that described under P. sesostris zestos. The abdominal scent glands emit an acrid odor.

TRIBE Papilionini

17. Papilio polyxenes asterius Stoll

SPECIMENS: 3♂♂, 2♀♀; 1,100-2,700 feet; 5 May-14 Sept.

This "fluted swallowtail" is uncommon and was collected only in the Pinus-Quercus Associes of the Deciduous Woodland and in a small, disjunct patch of oak forest NNE of Catemaco. Two of the five specimens are typical P. polyzenes asterius whereas the remaining three are of the morphotype named form americus Kollar. The flight is characteristic of most members of the genus Papilio-- rather rapid with strong wing beats and usually between six and 15 feet of the ground.

18. Papilio thoas autocles Rothschild & Jordan

SPECIMENS: 12♂♂, 5♀♀; 0-2,700 feet; 12 March-30 Sept.

This species is the most common swallowtail in the Sierra and occurs in Recently Abandoned Milpas, Pastures, Semi-Evergreen Seasonal Forest, Littoral Woodland, and along Hedgerows and most sunny road sides. The butterflies visit the blossoms of numerous species of plants and mud puddles. The flight is typical of Papilio spp. Larvae, described in Ross (1964d) were found on Piper marginatum and Piper kerberi, both of which are common along shaded stream banks in the Semi-Evergreen Seasonal Forest on the Santa Marta massif.

19. Papilio androgeus epidaurus Godman & Salvin

SPECIMENS: 7♂♂, 1♀; 1,100-5,100 feet; 24 March-13 Oct.

This papilionid is common above the canopy of the Elfin Woodland. Most butterflies were collected as they flew in circular patterns between eight and 12 feet above the peaks of Cerro Tuxtla

and Volcán Santa Marta. This behavior is commonly known as "hill-topping." Larvae (described in Ross, 1964b) were found during the summer months on Zanthoxylum elephantiasis, a small tree that is common in the hedgerows bordering Lago Catemaco.

20. Papilio anchisiades idaeus Fabricius

SPECIMENS: 6♂♂, 8♀♀; 500-1,800 feet; 20 June-9 Oct.

This swallowtail is common in Pastures and along Hedgerows in the vicinity of Lago Catemaco and most towns and villages throughout the Sierra where citrus trees are cultivated, Citrus spp. being the larval food plant. The flight is typical of most species in the genus. Immature stages are described in Ross (1964b).

21. Papilio victorinus victorinus Doubleday

SPECIMENS: 1♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 28 July 1962, 1♂: 2.5 mi. NNW Ocotal Chico, 3,000 feet, 12 April 1965, 1♀.

This species is rare; the male was collected in a sunny glade within the Semi-Evergreen Seasonal Forest and the female along a wide logging road in the Montane Rain Forest. Both specimens were flying rapidly approximately ten to 12 feet above the ground when collected.

FAMILY PIERIDAE

SUBFAMILY Dismorphiinae

22. Dismorphia (Dismorphia) praxinoe (Doubleday)

SPECIMENS: 8♂♂, 12♀♀; 0-4,300 feet; 13 March-17 Nov.

D. praxinoe is locally common, being found principally in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The flight is very weak and the butterflies very rarely rise more than four feet above the forest floor. As reported previously (Ross, 1964a), this slow, weak flight is very atypical for members of the Pieridae but very similar to that of many species in the family Ithomiidae.

23. Dismorphia (Dismorphia) fortunata (Lucas)

SPECIMENS: 34♂♂, 19♀♀; 700-5,000 feet; 9 Feb.-30 Oct.

This species is locally abundant and found principally in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The flight is weak and slow, much more so than that of the related species D. praxinoe. The butterflies usually fly within one to two feet of the forest floor. This flight behavior is very similar to that of several species of ithomiids, principally Oleria paula, Pteronymia cotytto, and Hypoleria cassotis (see Ross, 1964a also).

24. Dismorphia (Dismorphia) euryope (Lucas)

SPECIMENS: 11♂♂, 1♀; 3 mi. NNW Ocotal Chico, 4,100 feet, 23 Feb. 1965, 1♂; 12 March 1965, 1♀; 4,300 feet, 7 March 1965, 1♂; 4,400 feet, 17 June 1963, 1♂; 30 July 1963, 3♂♂; 4,800 feet, 5 April 1965, 1♂; 16 July 1963, 2♂♂: Peak Volcán Santa Marta, 5,000 feet, 11 June 1963, 1♂; 5,100 feet, 26 May 1965, 1♂.

This pierid is local and uncommon; all specimens were collected in the Montane Thicket and Elfin Woodland on Volcán Santa Marta. The flight, particularly that of the males, is more rapid and erratic than that of the preceding two species but still slower than that of most pierids. The butterflies were collected most frequently as they rested on leaves in relatively bright or sunny glades within the forests. The body fluids of pinched specimens smelled sour. The previous Veracruz record is the "Sierra Madre Oriental" (Hoffmann, 1940).

25. Dismorphia (Acmepteron) nemesis (Latreille)

SPECIMENS: 2♂♂. 2♀♀; 3,400-4,800 feet; 26 Aug., 30 Oct.

As the preceding species, D. nemesis is local in distribution and uncommon in abundance, being found principally in the Montane Thicket and Elfin Woodland on Volcán San Martín Tuxtla (although one specimen was taken on Volcán Santa Marta). The behavior is similar to that of D. euryope. The body fluids smelled sour.

26. Dismorphia (Enantia) albania (Bates)

SPECIMENS: 2♂♂, 2♀♀; 700-1,800 feet; 14 July-25 Sept.

This pierid is uncommon; two specimens were taken in a coffee finca within the Semi-Evergreen Seasonal Forest and the other two along a margin of the Lower Montane Rain Forest. The flight is similar to that of D. euryope and D. nemesis. The body fluids smelled sour.

27. Dismorphia (Enantia) jethys (Boisduval)

SPECIMENS: 12♂♂, 1♀; 4,800-5,200 feet; 30 March-16 May.

E. jethys is locally abundant and found only above the canopy of the Elfin Woodland during the spring months. The flight is that of a typical pierid-- rather rapid and erratic. The butterflies are attracted to the flowers of the composite Shistocarpha sp. The body fluids of pinched specimens smelled sour.

SUBFAMILY Pierinae

28. Catasticta nimbice nimbice (Boisduval)

SPECIMENS: 7♂♂, 11♀♀; 1,100-5,100 feet; 9 Feb.-30 Oct.

This species is locally abundant along the margins of the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and above the canopy of the Elfin Woodland. The flight is rather rapid, erratic, and usually of short duration, the butterflies alighting frequently on leaves ten to 15 feet above the ground. Only rarely was one individual encountered at a locality; thus, the species appears to be colonial. The body fluids of pinched specimens had a sour odor.

29. Archonias (Archonias) tereas (Hubner)

SPECIMENS: 3♂♂, 1♀; 1,000-2,450 feet; 4 Sept.-18 Nov.

Archonias tereas is locally common and found primarily in the Semi-Evergreen Seasonal Forest along stream bottoms on the southeast slopes of Volcán Santa Marta and in the Lower Montane Rain Forest along the fairly wide logging roads on the southern slopes of Vol-

cán San Martín Tuxtla. The flight is very slow, weak, and usually between two and six feet above the ground. The butterflies appear to be attracted to patches of Boehmeria sp., a plant that is common in disturbed areas within the rain forests. (As stated previously, this same plant is attractive to Parides arcas mylotes.) The body fluids of pinched individuals smelled slightly sour.

30. Appias (Glutophrissa) drusilla poeyi (Butler)

SPECIMENS: 9♂♂, 7♀♀; 500-2,400 feet; 23 April-26 July.

This species is abundant in Pastures, Recently Abandoned Milpas and in open, sunny glades within the Lower Montane Rain Forest. The flight is relatively rapid, erratic, and usually above ten feet of the ground. Adults are attracted to many species of flowering plants.

31. Leptophobia aripa elodia (Boisduval)

SPECIMENS: 7♂♂, 3♀♀; 1,100-5,200 feet; 6 Feb.-22 Nov.

This pierid is locally common and seen most frequently in and around the village of Ocotal Chico and above the canopy of the Elfin Woodland on Volcán Santa Marta. The flight is rapid, erratic, and usually above six feet of the ground.

32. Itaballia (Itaballia) demophile calydonia (Boisduval)

SPECIMENS: 5♂♂; 150 feet; 23 Aug.

This sulphur is locally common, all five specimens being taken in the Bursera-Sabal-Orbignya Associes of the Semi-Evergreen Seasonal

Forest. When collected, the butterflies either were flying in shaded areas of the woodland or visiting the flowers of the nettle Urera elata. The flight is slightly slower and less erratic than that of most pierids but much like that of Itaballia viardi (species number 34). The males are endowed with small, yellowish, dorsoposterior abdominal scent glands that were everted when the butterflies were pinched and which emitted an acrid odor.

33. Itaballia (Itaballia) pisonis kicaha (Reakirt)

SPECIMENS: 12♂♂, 11♀♀; 0-2,450 feet; 15 July-17 Nov.

This dimorphic species is locally abundant in the Lower Montane Rain Forest (especially near Coyame) and Swamp Forest. The males have a rather slow flight that usually is between five and ten feet of the ground (similar to the flight of I. demophile and slower than that of I. viardi, species number 34). The females' flight is very slow, weak, and usually within two feet of the ground, a behavior that is very similar to that of the unrelated ithomiid Aeria pacifica. Indeed, I occasionally collected I. pisonis, I. viardi, and A. pacifica within an area of ten to 15 square feet and until the specimens were removed from the net, I was unable to distinguish between the species. Of the 23 specimens collected, two males and one female exhibit a slight tendency towards the coloration of the opposite sex.

34. Itaballia (Pieriballia) viardi viardi (Boisduval)

SPECIMENS: 12♂♂, 9♀♀; 150-2,450 feet; 14 July-24 Sept.

This dimorphic species is locally abundant in the Lower Montane Rain Forest (especially in the vicinity of Coyame) and the Bursera-Sabal-Orbignya Associes of the Semi-Evergreen Seasonal Forest. Males have a fairly rapid and erratic flight that is similar to that of I. demophile and which usually is restricted to an area slightly beneath the forest canopy. However, the males occasionally descend to within five or ten feet of the ground in sunny glades. Females have a very slow and weak flight that very rarely is above two feet of the forest floor. As stated previously, this behavior is very similar to that of the sympatric ithomiid Aeria pacifica. Both males and females have abdominal scent glands that produce an acrid odor.

35. Ascia (Ascia) monuste monuste (Linnaeus)

SPECIMENS: 13♂♂, 8♀♀; 0-2,600 feet; 14 June-4 Sept.

The great southern white is abundant in Recently Abandoned Milpas, Pastures, the Littoral Woodland, and along road sides and most other relatively open, sunny areas (even in sunny glades within the Lower Montane Rain Forest). The flight is very rapid, erratic, and usually in excess of six feet of the ground. Adults visit the flowers of numerous plants.

36. Melete isandra (Boisduval)

SPECIMENS: 9♂♂, 7♀♀; 0-1,900 feet; 25 March-23 Oct.

M. isandra is locally abundant in Pastures and the small patches of Semi-Evergreen Seasonal Forest bordering Lago Catemaco, the Littoral

Woodland, and in and around the village of Ocotal Chico, the butterflies being attracted to the cultivated flowers growing in the villagers' gardens. The flight is slightly slower than that of most medium to large pierids and usually between three and ten feet of the ground.

SUBFAMILY Coliadinae

37. Colias (Zerene) cesonia (Stoll)

SPECIMENS: 8♂♂, 9♀♀; 0-2,300 feet; 27 June-19 Sept.

The dog-face is abundant in Recently Abandoned Milpas and Pastures, and along sunny road sides in the vicinity of Lago Catemaco and common in most open, sunny areas in other sections of the Sierra. The flight is typical of most sulfurs and the butterflies very frequently visit flowers, particularly the composite Melampodium kunthianum, and mud puddles.

38. Anteos clorinde (Godart)

SPECIMENS: 8♂♂, 1♀; 700-1,100 feet; 20 June-30 Sept.

The clorinde is common in most open, sunny areas throughout the Sierra regardless of plant formation. The butterflies are attracted to moist earth. In the pastures surrounding Lago Catemaco I observed females ovipositing on Cassia spectabilis. The flight is rapid with powerful wing beats and usually in excess of five feet of the ground.

39. Anteos maerula (Fabricius)

SPECIMENS: 10♂♂, 1♀; 0-1,900 feet; 29 March-14 Sept.

The maerula is common throughout the Sierra in most open, sunny areas regardless of plant formation. The butterflies have behavioral characteristics similar to those of A. clorinde.

40. Phoebis (Phoebis) sennae marcellina (Cramer)

SPECIMENS: 21♂♂, 15♀♀; 0-1,500 feet; 8 June-18 Nov.

The cloudless sulphur is the most abundant species of large pierid in the Sierra and is found in practically all open, sunny regions regardless of plant formation. The flight is characteristic of most members of the genus-- fast, erratic, and usually above six feet of the ground. The butterflies are attracted to mud puddles and numerous species of flowering plants. In the pastures surrounding Lago Catemaco I observed females ovipositing on Cassia occidentalis.

41. Phoebis (Phoebis) philea (Johansson)

SPECIMENS: 7♂♂, 11♀♀; 0-2,700 feet; 8 Feb.-13 Nov.

The orange-barred sulphur is common in practically all open, sunny sections of the range irrespective of plant formation. The flight is similar to that of most members of the genus. The larval food plant is Cassia occidentalis.

42. Phoebis (Phoebis) argante (Fabricius)

SPECIMENS: 8♂♂, 16♀♀; 0-1,900 feet; 22 June-18 Nov.

The argante sulphur is abundant in the Littoral Woodland and in Recently Abandoned Milpas and Pastures in the vicinity of Lago Catemaco. The flight is similar to that of most species of Phoebis. The butterflies are attracted to mud puddles and to the flowers of a variety of plants.

43. Phoebis (Phoebis) agarithe maxima (Neumoegen)

SPECIMENS: 5♂♂, 3♀♀; 0-2,450 feet; 14 Aug.-24 Oct.

The large orange sulphur is abundant in the Littoral Woodland, Deciduous Woodland (including the Pinus-Quercus Associes), and Recently Abandoned Milpas and Pastures above elevations of 1,400 feet on the Santa Marta massif. Thus, this species is sympatric with the sibling P. argante over part of the Sierra (the coast) and allopatric with it over other sections, P. argante occupying the Catemaco Basin and P. agarithe occupying the slightly higher elevations of the range (particularly the Santa Marta massif).

44. Phoebis (Phoebis) intermedia Butler

SPECIMENS: 2♂♂; 2 mi. NE Catemaco, 1,100 feet, 3 Aug. 1962, 1♂; 1.25 mi. NE Ocotal Chico, 2,700 feet, 28 July 1963, 1♂.

This tailed sulphur is rare in the Sierra; one male was collected at a water hole assemblage of pierids on the shore of Lago Catemaco and the other as it flew over a sunny knoll in the Pinus-Quercus Associes of the Deciduous Woodland. The flight is similar to that of other species of Phoebis.

45. Phoebis (Rhabdodryas) trite (Linnaeus)

SPECIMENS: 2♂♂; 0, 1,100 feet; 26 June, 15 Aug.

Although only two specimens were collected, this species is locally common in the Sierra, being found principally at mud puddle assemblages of pierids along sunny road sides. The flight is rapid and erratic.

46. Phoebis (Aphrissa) statira jada (Butler)

SPECIMENS: 4♂♂, 1♀; 0-1,100 feet; 8 June-14 Sept.

This species is locally common and found most frequently at mud puddle assemblages of pierids along sunny road sides. The flight is similar to that of other species of Phoebis.

47. Eurema (Eurema) albula (Cramer)

SPECIMENS: 8♂♂, 4♀♀; 75-2,600 feet; 20 June-25 Oct.

This pierid is abundant along the margins of all forests and woodlands throughout the Sierra as well as in most pastures and fields containing some tree cover. The flight is rather slow, weak, and usually near the ground-- a characteristic flight of most species of Eurema. In pastures surrounding Lago Catemaco, I observed females ovipositing on Picramnia andicola, a very common small bush.

48. Eurema (Eurema) daira daira (Godart)

SPECIMENS: 20♂♂, 19♀♀; 350-2,500 feet; 8 Feb.-19 Nov.

The fairy yellow is abundant in practically all open, sunny areas throughout the Sierra. The flight is the same as that of

most members of the genus.

49. Eurema (Eurema) boisduvaliana Felder & Felder

SPECIMENS: 10♂♂, 4♀♀; 1,100-3,400 feet; 20 Feb.-30 Oct.

Boisduval's sulphur is common in Pastures, Recently Abandoned Milpas, and along sunny road sides in the vicinity of Lago Catemaco and Ocotal Chico. The flight is typical of most members of the genus. The larval food plant is Cassia occidentalis. One of the four females collected is white instead of yellow.

50. Eurema (Eurema) xanthochlora (Kollar)

SPECIMENS: 14♂♂, 13♀♀; 500-4,100 feet; 17 March-29 Oct.

This pierid is locally common, being found principally along the margins of and just within the Lower Montane Rain Forest and the Semi-Evergreen Seasonal Forest. The flight is similar to that of most members of the genus. Sixteen of the 27 specimens were reared from chrysalids found on Cassia fruticosa, a small forest tree.

51. Eurema (Eurema) mexicana (Boisduval)

SPECIMENS: 9♂♂, 4♀♀; 500-2,700 feet; 9 March-16 Aug.

The Mexican sulphur is common in most open, sunny areas in the Sierra irrespective of plant formation. The behavior is characteristic of most members of the genus.

52. Eurema (Eurema) salome (Felder)

SPECIMEN: 1♂; Peak Volcán Santa Marta, 5,100 feet, 5 April 1965.

The salome sulphur is rare, the single male being taken as it flew over the eastern rim of the crater of Volcán Santa Marta above the canopy of the Elfin Woodland. The wind was fairly strong at the time and so the possibility exists that the specimen was carried up the slopes of the volcano from lower elevations and perhaps even from the coast since E. salome usually is not considered a forest inhabitor.

53. Eurema (Pyrisitia) proterpia (Fabricius)

SPECIMENS: 10♂♂, 3♀♀; 0-2,600 feet; 9 March-23 Oct.

The proterpia orange is abundant in most open, sunny areas throughout the Sierra regardless of plant formation. The behavior is similar to that of most other species of Eurema. Three specimens collected in the early spring have the tails on the hind wings elongated, the black scales on the wing veins reduced, and the ventral hind wings mottled orange. This morphotype is named form gundlachia (Poey) and was until recently considered a distinct species.

54. Eurema (Pyrisitia) lisa Boisduval & Le Conte

SPECIMENS: 7♂♂, 9♀♀; 1,100-2,900 feet; 25 June-13 Nov.

The little suphur is abundant in most open, sunny areas in the Sierra irrespective of plant formation, but especially in the Deciduous Woodland (including the Pinus-Quercus Associes). The behavior is typical for most members of the genus.

55. Eurema (Pyrisitia) nise nelphe (Felder)

SPECIMENS: 22♂♂, 9♀♀; 500-2,900 feet; 6 Feb.-25 Oct.

The nise sulphur is abundant (even more so than the sibling E. lisa) in most open, sunny areas throughout the range. Within the oak and pine-oak forests E. nise nelphe is the most common butterfly. The behavior is the same as that of most members of the genus.

56. Eurema (Pyrisitia) dina westwoodi (Boisduval)

SPECIMENS: 6♂♂, 8♀♀; 700-2,300 feet; 23 April-2 Aug.

This sulphur is abundant along the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest and in Pastures and along Hedgerows, particularly in the vicinity of Lago Catemaco. The butterflies seem to prefer partially shaded habitats. The larval food plant is Picramnia andicola, the same as that of E. albula. The flight is typical of most species in the genus.

57. Eurema (Abaeis) nicippe (Cramer)

SPECIMENS: 5♂♂, 2♀♀; 1,100, 1,900 feet; 8 June-21 July.

The sleepy orange is common in most open, sunny areas throughout the range, especially in Pastures and Recently Abandoned Milpas in the vicinity of Lago Catemaco. The larval food plant is Cassia occidentalis. The flight is slightly more rapid than that of most members of the genus.

58. Nathalis iole Boisduval

SPECIMENS: 4♂♂, 3♀♀; 1,100-2,100 feet; 21 June-14 Nov.

The dainty sulphur is locally common, being found principally in Recently Abandoned Milpas on the southern slopes of Volcán San Martín Tuxtla (elevation approximately 2,100 feet). The flight is more rapid and erratic than that of Eurema spp.

FAMILY ITHOMIIDAE

SUBFAMILY Ithomiinae

All of the 20 species of this subfamily recorded from the Sierra share several ecological and ethological characteristics. First, they all are shade-loving forest inhabitants, some species preferring relatively small patches of secondary forest and others the dark, dank, inner-most recesses of the mature montane forests. However, on cloudy days individuals often leave the forest cover and wander out into the fields and onto the road sides in the vicinity of the forests. Within the forests the species usually are rather colonial in that they are found in rather restricted areas instead of being scattered randomly throughout the plant formation. In addition, these colonies are non-specific, i.e., most of the species found within the given formation usually are found within the colony or "ithomiid assemblage" as it might better be termed. For the most part these "assemblages" are located in the dampest regions of the forest, e.g., in ravines, along streams, or near springs. Second, they all seem to be attracted to the blossoms of a few, non-related plants. These are Tournefortia glabra (a small, white-flowering tree that is locally common along the borders of the montane forests), Eupatorium macrophyllum (a purple-flowering annual or biennial that is common throughout the Sierra along the margins of and along the trails in the montane forests), Eupatorium pittieri (a tall, white-flowering shrub that is locally common in the montane forests), and Psychotria padifolia (a small, white-flowering bush that is locally common within the interiors of the

montane forests. When these plants are in blossom (summer and fall), I never encountered a plant that did not have a considerable number of ithomiids visiting it. In fact, most plants usually have several dozens of butterflies. (Ithomiids never were observed to be attracted to anything other than these four species of plants.) Third, the 20 species can be divided into two categories using flight behavior as a criterion. The first group includes the relatively small species with transparent wings (Ithomia leila, I. patilla, Oleria zea, O. paula, Episcada artena, Pteronymia cottyto, Greta nero, G. oto, G. anetta, and Hypoleria cassotis) and the yellow and black Aeria pacifica. These species fly very slowly with very weak wing beats; the flight usually is not over two to three feet above the forest floor. The second group includes the slightly larger and the large species, all of which are black and orange and which may be termed the "tiger complex" (Tithorea harmonia, Melinaea lilis, Mechanitis polymnia, M. egaensis, M. menapis, Hypothyris lycaste, Hyposcada virginiana, Napeogenes tolosa, and Dircenna klugi). These species have slightly more powerful flights that usually are between six and ten feet of the ground.

TRIBE Tithoreini

59. Tithorea harmonia salvadoris Staudinger

SPECIMENS: 7♂♂, 9♀♀; 0-1,400 feet; 9 May-7 Aug.

This species is locally abundant, the primary habitat being the Swamp Forest bordering Río Yougualtajapan on the coast; however, several localized colonies exist along other smaller streams and riv-

ers on the Santa Marta massif (principally Río Guasuntlan below Soteapan).

TRIBE Melinaeini

60. Melinaea lilis imitata Bates

SPECIMENS: 16♂♂, 12♀♀; 0-3,200 feet; 10 June-17 Nov.

This ithomiid is locally common in the Lower Montane Rain Forest and Montane Rain Forest.

TRIBE Mechanitini

61. Mechanitis polymnia lycidice Bates

SPECIMENS: 20♂♂, 19♀♀; 0-2,700 feet; 25 June-24 Oct.

M. polymnia lycidice and the two sibling species M. egaensis doryssus and M. menapis saturata are locally abundant and sympatric over most of the Sierra (see M. menapis saturata for possible exception), being found in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbignya Associes, and Swamp Forest.

62. Mechanitis egaensis doryssus Bates

SPECIMENS: 19♂♂, 9♀♀; 0-2,450 feet; 1 July-17 Nov.

This species is locally abundant in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbignya Associes, and Swamp Forest.

63. Mechanitis menapis saturata Godman

SPECIMENS: 6♂♂, 9♀♀; 75-3,100 feet; 17 March-5 Sept.

This species is locally common and is found in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The butterflies seem to prefer the mature montane forests over the more disturbed and less dense ones, as for example in the Catemaco Basin. However, the possibility exists that the species simply was overlooked at many localities because of its close resemblance to the two sibling species.

TRIBE Napeogenini

64. Hypothyris lycaste dionaea Hewitson

SPECIMENS: 19♂♂, 5♀♀; 0-3,400 feet; 17 June-17 Nov.

This ithomiid is locally abundant in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The butterflies seem to prefer the less disturbed forests.

65. Napeogenes tolosa (Hewitson)

SPECIMENS: 14♂♂, 14♀♀; 0-3,000 feet; 18 March-17 Nov.

Napeogenes tolosa is locally abundant in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbignya Associes, and Swamp Forest. The butterflies appear to prefer the more mature forests.

TRIBE Ithomiini

66. Ithomia leila Hewitson

SPECIMENS: 22♂♂, 1♀; 1,100-4,450 feet; 25 June-30 Oct.

This species is locally common in the Lower Montane Rain Forest, Montane Rain Forest, Montane Thicket, and Semi-Evergreen Seasonal Forest. The butterflies seem to prefer mature forests at medium and high elevations.

67. Ithomia patilla Staudinger

SPECIMENS: 25♂♂, 5♀♀;0-2,700 feet; 22 June-17 Nov.

I. patilla is locally abundant in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The species seems to prefer relatively undisturbed forests at low and medium elevations.

TRIBE Oleriini

68. Hyposcada virginiana virginiana (Hewitson)

SPECIMENS: 2♂♂, 1♀; 9 mi. ENE Sontecomapan, 0 feet, 17 Nov. 1962, 1♂: 5 mi. E Cuetzalapan, 2,450 feet, 4 Sept. 1962, 1♂: 4.5 mi. ESE Cuetzalapan, 2,500 feet, 5 Sept. 1962, 1♀.

This species is rare; all three specimens were collected in the Lower Montane Rain Forest.

69. Oleria zea (Hewitson)

SPECIMENS: 6♂♂, 2♀♀; 4,200-4,800 feet; 7 April-16 July.

O. zea is common only in several ravines in the Montane Thicket on Volcán Santa Marta.

70. Oleria paula (Weymer)

SPECIMENS: 13♂♂, 17♀♀; 0-4,300 feet; 11 Feb.-17 Nov.

This ithomiid is locally abundant in the Lower Montane Rain Forest, Montane Rain Forest, Montane Thicket, Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbignya Associes, and Swamp Forest.

71. Aeria pacifica Godman & Salvin

SPECIMENS: 1♂, 8♀♀; 0-3,000 feet; 17 March-5 Oct.

This yellow and black ithomiid is locally common in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The species seems to prefer relatively undisturbed forests.

TRIBE Dircennini

72. Dircenna klugi (Geyer)

SPECIMENS: 17♂♂, 20♀♀; 0-4,200 feet; 17 March-17 Nov.

This large and relatively transparent species is abundant in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest.

73. Episcada artena (Hewitson)

SPECIMENS: 11♂♂, 12♀♀; 1,650-4,600 feet; 20 June-29 Oct.

This species is locally common in the Lower Montane Rain Forest, Montane Rain Forest including the Liquidambar-Quercus Associes, Montane Thicket, Semi-Evergreen Seasonal Forest, and Hedgerows. The butterflies seem to prefer the less disturbed forests at medium and high elevations.

74. Pteronymia cottyto (Guérin)

SPECIMENS: 16♂♂, 11♀♀; 75-5,100 feet; 30 March-24 Oct.

P. cottyto is one of the most abundant and the most widespread ithomiid in the Sierra; the butterflies are found in practically all shaded and semi-shaded areas throughout the range regardless of plant formation.

TRIBE Godyridini

75. Greta nero (Hewitson)

SPECIMENS: 13♂♂, 20♀♀; 700-4,450 feet; 7 April-29 Oct.

This species is one of the most abundant ithomiids in the Sierra and is found in the Lower Montane Rain Forest, Montane Rain Forest, Montane Thicket, and the Semi-Evergreen Seasonal Forest.

76. Greta oto (Hewitson)

SPECIMENS: 16♂♂, 20♀♀; 1,100-4,300 feet; 17 March-13 Sept.

Greta oto is one of the most abundant species of ithomiid in the range and is found in the Lower Montane Rain Forest, Montane Rain Forest including the Liquidambar-Quercus Associes, Montane Thicket, and Semi-Evergreen Seasonal Forest.

77. Greta anetta (Guérin)

SPECIMENS: 24♂♂, 15♀♀; 2,900-4,750 feet; 15 June-25 Oct.

This species is locally abundant in the Montane Rain Forest, Montane Thicket, and Elfin Woodland.

78. Hypoleria cassotis (Bates)

SPECIMENS: 1♂♂, 8♀♀; 0-2,900 feet; 3 July-30 Oct.

This ithomiid is locally common in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The butterflies seem to prefer dank areas more than the other species in the family.

FAMILY DANAIDAE

SUBFAMILY Danainae

79. Danaus (Danaus) plexippus plexippus (Linnaeus)

SPECIMENS: 3♂♂, 3♀♀; 1,100-2,200 feet; 8 Feb.-26 Sept.

The monarch is common in most open, sunny areas only during fall and winter. The butterflies are attracted to the orange blossoms of Asclepias tuberosa, a plant that is abundant in the fields and pastures surrounding Lago Catemaco. The butterflies have a soaring flight.

80. Danaus (Tasitia) gilippus strigosus (Bates)

SPECIMENS: 8♂♂, 8♀♀; 0-1,900 feet; 19 May-23 Oct.

The queen is common in most open, sunny areas, but principally in Recently Abandoned Milpas and Pastures. Adults are attracted to the blossoms of Asclepias tuberosa, A. woodsoniana, Heliotropium indicum, and Lantana camara, all of which are common field plants. The butterflies have a soaring flight that usually is somewhat lower than that of D. p. plexippus.

81. Danaus (Tasitia) eresimus montezuma Talbot

SPECIMENS: 3♂♂, 2♀♀; 1,100, 2,200 feet; 21 Aug.-15 Oct.

The eresimus is uncommon and found in Recently Abandoned Milpas and Pastures. All specimens were taken as they fed on flowering plants-- Cordia spinescens and Bidens pilosa var. bimucronata. The flight is similar to that of the queen.

SUBFAMILY Lycoreinae

82. Lycorea ceres atergatis (Doubleday)

SPECIMENS: 1♂♂, 10♀♀; 0-2,450 feet; 27 June-23 Oct.

This species is locally common, being found along the margins of and just within the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest; in addition, the species is found in Pastures and Recently Abandoned Milpas when forest cover is near. The flight of this unusually marked danaid iw slower than that of the other three members of the family but similar to that of the larger ithomiids ("tiger complex") and the heliconians. Adults are attracted to the purple flowers of Heliotropium indicum, a common plant in the fields and pastures throughout the Sierra. In addition, adults were collected on the blossoms of Cordia spinescens, Eupatorium macrophyllum, and E. pittieri. As described previously, the latter two plant species are also attractive to the ithomiids. Indeed, on several occasions I observed L. ceres atergatis and several species of ithomiids feeding on a single flower head of E. macrophyllum. Thus, in addition to resembling several of the ithomiids, heliconians, and pierids in morphology and wing coloration, L. ceres atergatis resembles those species also in ecology and ethology.

FAMILY SATYRIDAE

SUBFAMILY Satyrinae

83. Pierella luna heracles Boisduval

SPECIMENS: 6♂♂, 1♀; 800-2,300 feet; 20 June-27 Aug.

This satyrid is common in most of the forested regions, particularly in the Lower Montane Rain Forest, Montane Rain Forest including the Liquidambar-Quercus Associes, and Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbigyna Associes. The butterflies seem to prefer flying up and down the forest trails; very few individuals were seen off trails. The flight is slow, usually never more than one foot above the ground, and of short duration--the butterflies alighting mainly on fallen leaves.

84. Taygetis mermeria excauata Butler

SPECIMENS: 3♂♂; 2,000, 3,000 feet; 12 April, 31 May.

This large species is uncommon and local; all three specimens were collected as they rested on the ground in coffee fincas in partially cleared Lower Montane Rain Forest on the Santa Marta massif. All specimens represent the morphotype that has been named form tenebrosus Blanchard.

85. Taygetis virgilia (Cramer)

SPECIMENS: 3♂♂, 1♀; 1,100, 1,950 feet; 29 June-12 Nov.

This satyrid is uncommon and found in the Semi-Evergreen Seasonal Forest and the Pinus-Quercus Associes of the Deciduous Woodland. The flight is relatively slow, very close to the

ground, and usually of short duration. Although the butterflies are found most frequently along trails, they do not adhere to these as tenaciously as does Pierella luna.

86. Taygetis andromeda (Cramer)

SPECIMENS: 10♂♂, 3♀♀; 0-2,900 feet; 17 March-18 Nov.

T. andromeda is common in the Lower Montane Rain Forest, Montane Rain Forest including the Liquidambar-Quercus Associes, Semi-Evergreen Seasonal Forest, and Swamp Forest. The species is the most common satyrid in the mature rain forests. The behavior is similar to that of T. virgilia.

87. Taygetis keneza Butler

SPECIMENS: 17♂♂, 6♀♀; 800-2,400 feet; 20 June-19 Nov.

This species is common in the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. The behavior is similar to that of T. virgilia.

88. Taygetis kerea Butler

SPECIMENS: 5♂♂, 3♀♀; 1 mi. SSE Ocotal Chico, 1,800 feet, 23 Oct. 1962, 2♂♂, 2♀♀: ocotal Chico, 1,900 feet, 24 Oct. 1962, 1♂: 1 mi. ENE Ocotal Chico, 2,100 feet, 23 Oct. 1962, 2♂♂; 24 Oct. 1962, 1♀.

This species is locally common; all specimens were taken in the Deciduous Woodland and the Pinus-Quercus Associes on several ridge slopes where the grass was between one and three feet in height. The behavior is similar to that of T. virgilia. Taygetis

kerea was recorded from Mexico previously only from Chiapas and the "Sierra Madre del Sur" (Hoffmann, 1940).

89. Euptychia gemma freemani (Stalings & Turner)

SPECIMENS: 19♂♂, 11♀♀; 350-2,700 feet; 8 Feb.-29 Oct.

The gemmed satyr is abundant in the grassy areas in the Savanna and the Deciduous Woodland (including the Pinus-Quercus Associes) on the Santa Marta massif. However, although the species is confined almost exclusively to these formations, several individuals were collected in the northwestern section of the range. Two were collected in grassy fields on ridges and one on the lawn of the Hotel Playa Azul. This last locale seems to be foreign to the species and I think that the specimen's occurrence there is the result of the previous day's weather condition (high northeast winds). Thus, the possibility exists that the butterfly is a stray blown down from higher and more suitable habitats.

90. Euptychia hesione (Sulz)

SPECIMENS: 11♂♂, 1♀; 0-2,100 feet; 8 Feb.-23 Oct.

This satyrid is abundant in the Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbigyna Associes, Swamp Forest, Lower Montane Rain Forest, and along Hedgerows. The species seems to prefer relatively disturbed forests. The flight is characteristic of most members of the genus-- rather slow, usually between one and two feet of the ground, and of short duration, the butterflies alighting frequently on vegetation.

91. Euptychia metaleuca (Boisduval)

SPECIMENS: 5♂♂, 4♀♀; 0-3,000 feet; 9 Feb.-5 Sept.

This satyrid is locally common in the Lower Montane Rain Forest, Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Swamp Forest. The butterflies seem to prefer relatively undisturbed forests. The behavior is similar to that of most other members of the genus.

92. Euptychia mollina Hubner

SPECIMENS: 6♂♂, 8♀♀; 900-4,100 feet; 8 Feb.-5 Oct.

E. mollina is common throughout most of the Sierra and found principally in the Semi-Evergreen Seasonal Forest, Deciduous Woodland including the Pinus-Quercus Associes, Lower Montane Rain Forest, and along Hedgerows. The flight usually is approximately three to four feet above the ground and hence slightly higher than that of most species of Euptychia.

93. Euptychia labe Butler

SPECIMENS: 3♂♂, 5♀♀; 500-3,300 feet; 26 May-25 Oct.

This species is local and uncommon, being found in the Semi-Evergreen Seasonal Forest, Lower Montane Rain Forest, and Montane Rain Forest including the Liquidambar-Quercus Associes. The flight is typical of most members of the genus.

94. Euptychia similis Butler

SPECIMENS: 2♂♂, 1♀; 1 mi. NNE Ocotal Chico, 2,100 feet, 14 June 1963, 2♂♂: 2 mi. NE Catemaco, 1,100 feet, 24 June 1962, 1♀.

This species is rare, although because of its close similarity to E. themis and E. undina, both of which may be only morphotypes of E. similis, additional butterflies may have been overlooked. The two males were collected along a wide trail in the Liquidambar-Quercus Associes of the Montane Rain Forest and the single female along the margin of a section of the Semi-Evergreen Seasonal Forest bordering Lago Catemaco. The behavior is similar to that of most members of the genus.

95. Euptychia themis Butler

SPECIMENS: 1♂♂, 1♀; 0-2,700 feet; 20 Feb.-13 Nov.

This satyrid is common in and along the margins of all forests except the Montane Thicket and Elfin Woodland. The behavior is typical of most members of the genus.

96. Euptychia undina Butler

SPECIMENS: 6♂♂, 9♀♀; 150-3,000 feet; 10 June-10 Nov.

E. undina is common and found in and along the margins of the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, Montane Rain Forest including the Liquidambar-Quercus Associes, and Swamp Forest. Although the species is sympatric with E. themis over most of the Sierra, E. undina seems to prefer less disturbed areas than E. themis.

97. Euptychia disaffecta Butler & Druce

SPECIMENS: 1♂♂, 6♀♀; 750-3,400 feet; 8 Feb.-30 Oct.

This species is locally abundant and found principally in grass fields within the Liquidambar-Quercus Associes of the Montane Rain Forest. The behavior is typical of most species of Euptychia.

98. Euptychia hermes sosybius (Fabricius)

SPECIMENS: 15♂♂, 5♀♀; 1,100-2,200 feet; 6 Feb.-13 Nov.

The Carolina satyr is the most abundant and most widely distributed satyrid in the Sierra; the butterflies are found in all shaded and partially shaded areas except the interiors of the montane forests. The behavior is similar to that of most members of the genus.

99. Euptychia gigas Butler

SPECIMENS: 8♂♂, 8♀♀; 800-2,300 feet; 23 Oct.-20 Nov.

This satyrid is locally common, being found in the Deciduous Woodland (including the Pinus-Quercus Associes) and several small patches of Semi-Evergreen Seasonal Forest fringing Lago Catemaco. The butterflies were collected only during the fall months. Within the oak and pine-oak communities, E. gigas was taken most frequently in tall grassy areas on the slopes of several ridges.

100. Euptychia libye (Linnaeus)

SPECIMENS: 9♂♂, 4♀♀; 0-2,800 feet; 11 Feb.-19 Nov.

E. libye is common in most forests, particularly the Semi-Evergreen Seasonal Forest, Lower Montane Rain Forest, Swamp Forest,

and the Deciduous Woodland (including the Pinus-Quercus Associes). The flight is similar to that of most members of the genus.

101. Euptychia glaucina Bates

SPECIMENS: 1♂, 6♀♀; 150-2,900 feet; 23 June-24 Oct.

This satyrid is uncommon and found primarily in coffee fincas within the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. The behavior is typical of the group.

102. Euptychia sericella Bates

SPECIMENS: 17♂♂, 2♀♀; 1,800-2,700 feet; 13 April-25 Oct.

This iridescent species is locally abundant in the Semi-Evergreen Seasonal Forest and the Liquidambar-Quercus Associes of the Montane Rain Forest. Within these formations the butterflies are restricted to the relatively open, tall grassy areas. The behavior is typical of most Euptychia spp.

103. Euptychia sp. near alcinoe Felder

SPECIMENS: 6♂♂; 1,100, 1,800 feet; 30 June-13 Nov.

This species, which thus far remain undetermined because of the specimens' poor condition, is local and uncommon; all specimens were collected in disturbed sections of Semi-Evergreen Seasonal Forest. The behavior is similar to that of other species in the genus.

104. Pedaliodes pisonia circumducta (Thieme)

SPECIMENS: 5♂♂, 2♀♀; 4,300-5,000 feet; 5 April-3 Aug.

This species is locally common in the Elfin Woodland on Volcán Santa Marta. The butterflies occur in the small, restricted grassy and shrubby areas that exist on several of the upper ridges where sunlight is able to reach the ground. The flight is slightly faster and more powerful than that of most species in the family.

105. Dioriste tauropolis (Doubleday & Hewitson)

SPECIMENS: 20♂♂; 2,400-5,400 feet; 23 Feb.-30 Oct.

This brightly colored satyrid is locally abundant in the Montane Thicket and Elfin Woodland. The butterflies were collected most frequently in sunlit patches of forest as they rested on leaves or as they chased one another. The flight is quicker, more erratic, and usually not as low to the ground as that of most satyrids but very similar to that of the pierids Dismorphia eurydice and D. nemesis, both of which are sympatric with Dioriste tauropolis.

SUBFAMILY Brassolinae

106. Opsiphanes (Opsiphanes) boisduvalii Westwood & Hewitson

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 5 Oct. 1962.

This species is rare; the single specimen was collected as it imbibed fermenting sap oozing from the trunk of a citrus tree in a pasture near Hotel Playa Azul.

107. Opsiphanes (Opsiphanes) cassiae castaneus Stichel

SPECIMENS: 5♂♂, 8♀♀; 800, 1,100 feet; 20 March-3 Oct.

This species is common only in Pastures in the Catemaco Basin. The butterflies were collected most frequently as they fed on sap oozing from the trunks of citrus trees. The flight is extremely rapid with powerful wing beats. The androconia on the hind wings and abdomens of males produce a sweetish odor.

108. Eryphanis aesacus (Herrich-Schaeffer)

SPECIMENS: 2♂♂; 2.5 mi. SW Sontecomapan, 800 feet, 16 July 1962, 1♂: 2 mi. SW Sontecomapan, 900 feet, 3 Nov. 1962, 1♂.

E. aesacus is rare in the Sierra. Both specimens were collected along the margins of the Lower Montane Rain Forest; one was imbibing moisture from a rotting corncob and the other was resting on the trunk of a small tree.

109. Caligo memnon (Felder)

SPECIMENS: 8♂♂, 6♀♀; 0-1,800 feet; 15 March-20 Nov.

This large species is common in most of the forests at relatively low altitudes, particularly the Semi-Evergreen Seasonal Forest including the Bursera-Sabal-Orbigyna Associes, Lower Montane Rain Forest, Swamp Forest, and Littoral Woodland. The butterflies are primarily crepuscular-- during the day they rest on tree trunks but at dusk they fly up and down the forest paths and even venture out onto the road sides and into pastures and fields. The flight is rapid, undulating, and usually between two and six feet of the

ground. The androconia on the hind wings and abdomens of males produce a sweet odor.

110. Caligo uranus Herrich-Schaeffer

SPECIMENS: 5♂♂, 2♀♀; 900-2,800 feet; 7 April-? Nov.

This brilliantly marked Caligo is uncommon and found primarily in the Lower Montane Rain Forest and Montane Rain Forest during late summer and fall. The behavior is similar to the related species C. memnon.

FAMILY NYMPHALIDAE

SUBFAMILY Amathusiinae

TRIBE Morphini

111. Morpho theseus justiciae Salvin & Godman

SPECIMENS: 7♂♂; 2,450, 4,300 feet; 4-17 April.

This species is abundant in the Montane Rain Forest, Montane Thicket, and Elfin Woodland only during the spring and fall months. Therefore, the species apparently is double brooded with a relatively long life cycle. The butterflies have a slow, undulating flight that usually is above the forest canopy. Individuals rare entered shaded areas; this behavior also was note by Welling (1966) in Oaxaca. The majority of the specimens were collected on a sunny, open ridge on the upper slopes of Volcán Santa Marta. The slopes of this ridge are covered with heavy montane rain forest and so the butterflies glided above the canopy up one slope and down the other, crossing the open ridge top in the process. By positioning myself in an inconspicuous place on this crest (the butterflies have a keen sense of sight and usually reverse flight direction when they detect conspicuous movements), I was able to net several individuals as they glided past. The subspecies justiciae is represented in the Sierra by an endemic blue form that has been named schwezeri Le Moult & Real but which probably should be considered a distinct subspecies because of its geographic isolation.

112. Morpho polyphemus luna Butler

SPECIMENS: 26♂♂, 6♀♀; 1,600-4,800 feet; 16 July-1 Oct.

This white Morpho is abundant in the Elfin Woodland, Montane Thicket, and Montane Rain Forest only in late summer and fall. The species first appears at the highest elevations in early or mid July. Then as the season progresses, the range is extended so that individuals become more and more common at slightly lower elevations. By September and October the butterflies are seen occasionally at elevations slightly below 2,000 feet, that is, when mature rain forest is present. The flight is similar to that of the preceding species with the exception that M. polyphemus luna glides more frequently and does not hesitate to fly beneath the forest canopy (at which times the butterflies often descend to within five or ten feet of the ground).

113. Morpho peleides montezuma Guénée

SPECIMENS: 2♂♂, 1♀; 0-5,100 feet; 9 Feb.-19 Oct.

The peleides morpho is common at relatively low elevations and found in or along the margins of all formations except the Montane Thicket and Elfin Woodland. The butterflies seem to prefer sunny trail and glades within relatively disturbed forests. The flight is more rapid than that of the preceding two species and usually between two and five feet of the ground.

SUBFAMILY Acraeinae

TRIBE Acraeini

114. Actinote leucomelas (Bates)

SPECIMENS: 3♂♂, 1♀♀; 1,100-4,800 feet; 12 March-17 April, 10 Oct.-18 Nov.

Actinote leucomelas is locally and seasonally common, being found along the margins of the Semi-Evergreen Seasonal Forest, Lower Montane Rain Forest, the Pinus-Quercus Associes of the Deciduous Woodland, Montane Rain Forest, and Montane Thicket during the spring and fall months. Within the pine-oak forest, the butterflies were collected frequently on the flowers of the composite Bidens pilosa var. bimucronata. The flight is slow, weak, and usually between 12 and 20 feet of the ground. Larvae were found on Liabum dimidium, an uncommon shrub along small streams below the village of Ocotal Chico.

115. Actinote guatemalena veraecruzis Jordan

SPECIMENS: 5♂♂, 13♀♀; 0-2,700 feet; 10 Feb.-17 May.

This species is common in the Deciduous Woodland and the Pinus-Quercus Associes only during the spring months. The butterflies are attracted to the white blossoms of Vernonia leiocarpa, a common composite in the pine-oak and oak communities. The flight is relatively slow, weak, and usually between ten and 15 feet above the ground.

SUBFAMILY Heliconiinae

All of the members of this subfamily possess yellowish abdominal scent glands (the glands being more highly developed in the female of each species and in the members of the genus Heliconius). These glands are everted when the butterflies are disturbed and

emit acrid odors.

116. Philaethria dido dido (Clerck)

SPECIMENS: 4♂♂, 2♀♀; 900, 1,900 feet; 12 July-26 Oct.

This large green and balck species is common in the Pinus-Quercus Associes of the Deciduous Woodland during the fall months. The butterflies were see most frequently as they flew around the bright green foliage of mango and citrus trees or as they visited the flowers of cultivated marigolds (Tagetes sp.) in the Indian villages. The flight is relatively slow, weak, and usually between ten and 20 feet of the ground.

117. Dryadula phaetusa (Linnaeus)

SPECIMENS: 8♂♂, 3♀♀; 1,100-2,100 feet; 1 July-28 Sept.

This heliconian is common in Pastures, Recently Abandoned Milpas and along Hedgerows in the Catemaco Basin and along the coast but uncommon in most other localities. The butterflies are attracted to the blossoms of Lantana camara. The flight is of a moderate velocity and usually about four feet above the ground.

118. Agraulis vanillae incarnata (Riley)

SPECIMENS: 7♂♂, 2♀♀; 0-2,700 feet; 21 June-23 Oct.

The Gulf fritillary is abundant in the Littoral Woodland along the coast and common to uncommon in Pastures and Recently Abandoned Milpas in other sections of the range. The butterflies are attracted to the flowers of Lantana camara. The flight is

slightly slower than that of the previous two species and usually between one and three feet of the ground.

119. Dione juno huascama (Reakirt)

SPECIMENS: 10♂♂, 5♀♀; 0-5,100 feet; 5 May-29 Oct.

This species is common to abundant in Pastures, Recently Abandoned Milpas and along Hedgerows in the Catemaco Basin but uncommon in most other localities. All specimens were collected on the blossoms of Lantana camara. The flight is similar to that of Agraulis vanillae.

120. Dione moneta poeyii (Butler)

SPECIMENS: 10♂♂; 4,700-5,400 feet; 2 March-26 Aug.

This species is common only above the canopy of the Elfin Woodland on the peaks of the major volcanoes. When collected, the butterflies were "hill topping."

121. Dryas julia julia (Fabricius)

SPECIMENS: 6♂♂, 7♀♀; 500-5,400 feet; 3 March-25 Aug.

The julia is common to abundant in most open, sunny areas regardless of plant formation. The species is the most common and widely distributed heliconian excepting the genus Heliconius. The flight is less rapid and usually nearer the ground than that of the preceding species.

122. Heliconius (Eueides) cleobaea zorcaon (Reakirt)

SPECIMENS: 1♂♂, 12♀♀; 0-2,300 feet; 11 Feb.-23 Oct.

This species is abundant and the most common heliconian in the Sierra, being found in or along the margins of all formations except the Montane Rain Forest, Montane Thicket, and Elfin Woodland. The flight is slow, relatively weak, and usually between three and six feet of the ground. The larval food plants are Passiflora ambigua in the Ocotal Chico region and P. serratifolia in the Catemaco Basin. Immature stages are described in Ross (1964d).

123. Heliconius (Semelia) vibilia vialis (Stichel)

SPECIMENS: 2♀♀; Vigía, 1,750 feet, 5 Aug. 1963, 1♀: Ocotal Chico, 1,900 feet, 28 Oct. 1962, 1♀.

This butterfly is rare; one female was collected as it fed on the blossoms of Cephaelis elata along a trail in the Lower Montane Rain Forest and the other as it fed on marigolds in a village garden.

124. Heliconius (Semelia) lineata (Salvin & Godman)

SPECIMENS: 9♂♂, 5♀♀; 700-5,100 feet; 26 May-19 Oct.

H. lineata is locally common and found primarily along the borders of the Semi-Evergreen Seasonal Forest and Lower Montane Rain Forest. Several specimens were collected as they fed on the flowers of Cordia alliodora, a white flowering shrub that is common in most fields and along the borders of forests. The flight is relatively slow, weak, and approximately ten to 15 feet above the ground.

125. Heliconius (Semelia) aliphera gracilis (Stichel)

SPECIMENS: 7♂♂, 3♀♀; 900-1,900 feet; 22 June-28 Sept.

This species is more common and less local than the preceding, being found most frequently in Pastures, Recently Abandoned Milpas and along Hedgerows and open, sunny road sides. Most specimens were collected as they fed on the white flowers of Bidens pilosa var. bimucronata. The flight is relatively slow, weak, and usually within three or four feet of the ground.

126. Heliconius (Heliconius) ismenius telchinia Doubleday

SPECIMENS: 14♂♂, 10♀♀; 0-3,500 feet; 27 Feb.-5 Oct.

This large heliconian is abundant in all formations except the Montane Thicket, Elfin Woodland, Savanna, Deciduous Woodland (including the Pinus-Quercus Associes). The flight is relatively slow, weak, and approximately between six and eight feet of the ground. The butterflies seem to prefer partially shaded areas.

127. Heliconius (Heliconius) doris transiens Staudinger

SPECIMENS: 22♂♂, 4♀♀; 10-2,900 feet; 17 May-26 Oct.

This black and red species is locally abundant, the butterflies being found most frequently in sunny glades within the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. The butterflies are attracted to the orange flowers of the vine Anguria tabascensis.

128. Heliconius (Heliconius) sapho leuce Doubleday

SPECIMENS: 31♂♂, 8♀♀; 700-3,200 feet; 17 March-29 Oct.

This blue and white heliconian is abundant only in the Lower Montane Rain Forest and Montane Rain Forest (including the Liquidambar-Quercus Associes) on the Santa Marta massif. The flight is relatively slow, weak, and usually between four and ten feet of the ground in sunny glades and along bright trails. The butterflies are attracted to the blossoms of Anguria tabascensis.

129. Heliconius (Heliconius) sara veraepacis Bates

SPECIMEN: 1♀; 0.25 mi. S Ocotal Grande, 1,800 feet, 15 May 1965.

This species is rare; the single female was collected in a coffee finca in the Lower Montane Rain Forest. The butterfly was flying approximately nine feet above the ground in the company of two individuals of Heliconius doris.

130. Heliconius (Heliconius) petiveranus Doubleday

SPECIMENS: 14♂♂, 4♀♀; 0-2,300 feet; 23 April-25 Oct.

Heliconius petiveranus is abundant in or along the margins of all formations except the Montane Rain Forest, Montane Thicket, and Elfin Woodland. The flight is extremely weak, in fact, the weakest of that of all species of Heliconius collected, and usually within two feet of the ground. The larval food plants are Passiflora biflora in the Ocotal Chico region and Catemaco Basin, and P. coriacea in the Catemaco Basin also. The immature stages have been described in Ross (1964d).

131. Heliconius (Heliconius) charitonius vazquezae Comstock & Brown

SPECIMENS: 6♂♂, 4♀♀; 700-1,800 feet; 16 Feb.-16 Sept.

The zebra is common to abundant in or along the margins of all formations except the Montane Thicket and Elfin Woodland. This species seems to prefer sunny, open areas more than do the other members of the subgenus Heliconius. The flight is relatively slow, weak, and usually between three and six feet of the ground.

132. Heliconius (Heliconius) hortense Guérin

SPECIMENS: 10♂♂, 5♀♀; 1,800-5,100 feet; 17 June-14 Oct.

This heliconian is uncommon and found only in the Montane Thicket, Elfin Woodland, and Montane Rain Forest. The butterflies were collected most frequently as they flew in sunny glades and along bright trails. The flight is relatively rapid and usually between two and five feet of the ground.

SUBFAMILY Nymphalinae

TRIBE Argynididi

133. Euptoieta hegesia hoffmanni Comstock

SPECIMENS: 5♂♂, 5♀♀; 1,100-2,200 feet; 6 June-28 Oct.

The Mexican fritillary is abundant in most sunny, open areas regardless of plant formation. The butterflies visit the flowers of a variety of plants. The flight is of moderate velocity and usually between two and three feet above the ground. The larval food plant is Turnera ulmifolia, a small plant that is common in sunny areas within the pine-oak forest and other relatively open areas on the Santa Marta massif. Ross (1964d) described the egg stage.

134. Chlosyne janais (Drury)

SPECIMENS: 12♂♂, 13♀♀; 0-2,000 feet; 18 March-18 Sept.

This relatively large Chlosyne is abundant in Pastures, Recently Abandoned Milpas, Littloral Woodland, Semi-Evergreen Seasonal Forest, and the Lower Montane Rain Forest when the larval food plant Odontonema callistachyum is present. The butterflies are particularly abundant in the pastures along the coast. The flight is relatively weak and interrupted by frequent gliding periods. Immature stages are described in Ross (1964d).

135. Chlosyne hippodrome (Geyer)

SPECIMENS: 15♂♂, 7♀♀; 500-2,200 feet; 30 June-31 Oct.

Chlosyne hippodrome is uncommon to common and found most frequently along sunny road sides and in Pastures and Recently Abandoned Milpas. The butterflies visit the flowers of composites, particularly Melampodium kunthianum and Baltimora recta, very frequently. The behavior of C. hippodrome is different from that of the other four species of Chlosyne collected-- the flight is slower with relatively uninterrupted wing beats and usually between seven and 15 feet above the ground. In addition, the butterflies visit mud puddles very infrequently.

136. Chlosyne lacinia lacinia (Geyer)

SPECIMENS: 14♂♂, 5♀♀; 1,100-2,700 feet; 20 June-25 Sept.

Scudder's patched butterfly is abundant (more abundant than C. janais) in most sunny, open areas throughout the range where

flowers occur. The flight is similar to that of C. janais. The butterflies are attracted to mud puddles and flowers. One of the 19 specimens collected is almost totally dark and appears to be the morphotype named form ardema Reakirt.

137. Chlosyne erodyle (Bates)

SPECIMENS: 6♂♂, 7♀♀; 500-2,200 feet; 20 June-23 Oct.

This species is common only in grassy-shrubby fields within the Deciduous Woodland and the Pinus-Quercus Associes and several Recently Abandoned Milpas on the SSW slope of Volcán San Martín Tuxtla. Thus, the species seems to prefer slightly higher elevations than do the other species of Chlosyne. The behavior is very similar to that of C. janais and C. lacinia.

138. Chlosyne definita Aaron

SPECIMEN: 1♀; 1.25 mi. N Ocotal Chico, 2,300 feet, 26 July 1963.

This species is rare; the single female was taken as it fed on Calea longipedicellata in the Pinus-Quercus Associes of the Deciduous Woodland.

139. Thessalia theona theona (Ménétriés)

SPECIMENS: 16♂♂, 7♀♀; 0-4,700 feet; 17 March-4 Oct.

This checker spot is locally abundant and found in colonies in most open, sunny grassy areas, but particularly those within the Savanna and Deciduous Woodland (including the Pinus-Quercus Associes). The flight is relatively rapid, erratic, and usually within two feet

of the ground-- very much like that of Phyciodes spp.

140. Phyciodes (Phyciodes) vesta (Edwards)

SPECIMENS: 6♂♂, 7♀♀; 1,050-1,900 feet; 17 June-13 Nov.

The vesta crescent is common in most open, sunny areas regardless of plant formation. The flight is of moderate velocity, rather erratic, and usually within two feet of the ground. The butterflies are attracted to the flowers of a variety of plants. The species is represented in the Sierra by the morphotype known as form bucardi Godman & Salvin.

141. Phyciodes (Eresia) frisia tulcis (Bates)

SPECIMENS: 10♂♂, 4♀♀; 1,050-1,700 feet; 27 June-28 Sept.

The Cuban crescent is common and found primarily in Pastures and Recently Abandoned Milpas in the Catemaco Basin. The behavior is similar to that of P. vesta, which is typical of most members of the genus.

142. Phyciodes (Eresia) claudina guatemalena (Bates)

SPECIMENS: 7♂♂, 7♀♀; 75-2,600 feet; 6 Feb.-19 Oct.

This species is abundant in most open, sunny areas, particularly along the margins of Hedgerows and the Semi-Evergreen Seasonal Forest. The flight is slightly slower and weaker than that of most species of Phyciodes but similar to that of several heliconians-- particularly Dryas julia and Heliconius aliphera, both of which are sympatric with P. claudina guatemalena.

143. Phyciodes (Eresia) phillyra (Hewitson)

SPECIMENS: 15♂♂, 11♀♀; 700-2,700 feet; 14 July-19 Oct.

This dimorphic species is locally common in and along the margins of the Lower Montane Rain Forest and the Semi-Evergreen Seasonal Forest and also in Recently Abandoned Milpas. The males were collected most frequently in the semi-shaded areas along the margins of forests and in sunny fields providing forest cover was near; the flight is rapid and erratic, very similar to that of the heliconians Dione juno and Agraulis vanillae. The females were found most frequently in shaded areas just within the forests; the flight is very slow and weak, very similar to that of several ithomiids and dismorphines. Both sexes are attracted to flowering composites, particularly Bidens pilosa var. bimucronata, which is common in fields and along the margins of forests.

144. Phyciodes (Tritanassa) atronia (Bates)

SPECIMENS: 4♂♂, 2♀♀; 1,500-2,200 feet; 24 Aug.-19 Oct.

This crescent is locally common in Recently Abandoned Milpas and Pastures. During the summer I found individuals feeding on blossoming composites only in several fields on the SSW slope of Volcán San Martin Tuxtla. However later in the year (fall) I found the species at lower elevations in several fields in the vicinity of Sontecomapan. The behavior is typical of most members of the genus.

145. Phyciodes (Tritanassa) ardys ardys Hewitson

SPECIMENS: 10♂♂, 3♀♀; 1,100, 1,800 feet; 20 June-23 Oct.

This crescent is common-- principally in the Catemaco Basin-- in Recently Abandoned Milpas and Pastures. The behavior is similar to that of most species of Phyciodes.

146. Phyciodes (Tritanassa) eranites mejicana (Roeber)

SPECIMEN: 1♀; 2.5 mi. SW Sontecomapan, 1,500 feet, 19 Oct. 1962.

This species is rare; the single specimen was collected as it fed on the yellow blossoms of Baltimora recta, which was growing in a pasture bordered by Lower Montane Rain Forest.

147. Phyciodes (Tritanassa) myia (Hewitson)

SPECIMENS: 13♂♂, 14♀♀; 800-2,700 feet; 15 May-18 Oct.

Phyciodes myia is locally abundant, being found principally in Pastures and Recently Abandoned Milpas and along sunny road sides. The largest concentration of butterflies was found on the peak of Cerro Tuxtla. The butterflies visit the flowers of Melampodium kunthianum, Bidens pilosa var. bimucronata, and Baltimora recta very frequently. The behavior is typical of most species of Phyciodes.

148. Phyciodes (Tritanassa) griseobasolis Roeber

SPECIMENS: 9♂♂, 4♀♀; 1 mi. SE Sontecomapan, 700 feet, 14 July 1962; 1♂: 3 mi. SW Sontecomapan, 1,600 feet, 1 Oct. 1962, 3♂♂: 2.5 mi. SW Sontecomapan, 1,700 feet, 18 Sept. 1962, 1♂, 3♀♀: 8 mi. SSE Catemaco, 1,950 feet, 29 Sept. 1962, 1♂: 3 mi. W Santiago Tuxtla, 2,100 feet, 22 June 1962, 1♂; 2,700 feet, 22 June 1962, 2♂♂, 1♀.

This species, which is a sibling of P. myia, is locally abundant (but slightly less so than the sibling) in Pastures and Recently Abandoned Milpas and along sunny road sides. Both species appear to be completely sympatric. In fact, the largest concentration of P. griseobasalis was found also on the peak of Cerro Tuxtla. The behavior is typical of most members of the genus. The nearest recorded locale for P. griseobasalis (= P. ofella) is the "Oriente & Sur de Chiapas" (Hoffmann, 1940).

149. Phyciodes (Tritanassa) clara (Bates)

SPECIMEN: 1♀; 2.5 mi. SW Sontecomapan, 1,300 feet, 6 Aug. 1962.

This crescent is rare; the single female was collected along the margin of the Lower Montane Rain Forest. The butterfly was resting on a leaf approximately three feet above the ground.

TRIBE Nymphalini

150. Polygonia g-argenteum (Doubleday & Hewitson)

SPECIMENS: 2♀♀; 2.5 mi. SW Sontecomapan, 1,200 feet, 18 Nov. 1962.

This angle wing is rare and was collected in the Lower Montane Rain Forest. The two females were given to me by a local collector (Abrham Ramírez) who supposedly collected them in trap nets (rotting bananas being used as bait).

151. Vanessa virginiensis (Drury)

SPECIMENS: 1♂♂, 6♀♀; 1,900-5,400 feet; 16 June-30 Oct.

The painted lady is locally common and found principally in the Elfin Woodland and the Pinus-Quercus Associes of the Deciduous Wood-

land. Most specimens were collected as they engaged in "hill-topping" over the high peaks and knolls within the range, particularly Cerro Tuxtla. However, individuals occasionally were seen as they rested on the red dirt trails within the pine-oak forest. The flight is of moderate velocity, erratic, and usually between four and 15 feet of the ground.

152. Junonia evarete evarete (Cramer)

SPECIMENS: 3♂♂, 10♀♀; 1,100-2,700 feet; 17 March-26 Oct.

The buckeye is farily common along roads and trails in the Deciduous Woodland and the Pinus-Quercus Associes. The butterflies were collected most frequently as they rested on sunlit bare soil with their wings held in horizontal positions. The flight is rather rapid, erratic, and usually of short duration.

153. Anartia jatrophae luteipicta Fruhstorfer

SPECIMENS: 8♂♂, 4♀♀; 0-2,700 feet; 11 Nov.-27 Aug.

The white peacock is common in most open, sunny areas regardless of plant formation, but especially at lower elevations. The butterflies are attracted to a variety of flowering plants. The flight is relatively slow and usually between one and three feet of the ground.

154. Anartia fatima venusta Fruhstorfer

SPECIMENS: 5♂♂, 5♀♀; 0-1,800 feet; 27 Feb.-28 Aug.

The fatima is the most abundant and widely distributed but-

terfly in the Sierra, being found in practically all open and sunny areas regardless of plant formation. The behavior is similar to that of the preceding species. Two specimens collected in the spring have the ventral surfaces of their wings coated with brown scales.

155. Metamorpha stelenes biplagiata (Fruhstorfer)

SPECIMENS: 14♂♂, 2♀♀; 1,100, 1,200 feet; 21 June-8 Oct.

The malachite is common along the margins of the Semi-Evergreen Seasonal Forest and along Hedgerows in the vicinity of Lago Catemaco. Most butterflies were collected as they fed on the fermenting juices of fallen mangos and figs (Ficus padifolia). The specimens collected in August, September, and October, have the ventral surfaces of their wings coated with silvery scales; this morphotype has been named form pallida Fruhstorfer. The flight is characteristic of most species of nymphalines-- rather rapid, erratic, and usually between five and ten feet of the ground.

156. Metamorpha epaphus (Latreille)

SPECIMENS: 3♂♂, 6♀♀; 1,100-2,450 feet; 3 March-20 Sept.

This species is common in Recently Abandoned Milpas on the SSW slope of Volcán San Martín Tuxtla but uncommon in all other locales. Most butterflies were collected as they fed on the blossoms of unidentified tall yellow composites. The flight is of moderate velocity and usually relatively high-- approximately between 12 and 20 feet above the ground.

157. Hypanartia lethe (Fabricius)

SPECIMENS: 4♂♂, 2♀♀; 1,100-1,950 feet; 24 June-18 Nov.

H. lethe is uncommon and found most frequently along the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. The butterflies were collected as they fed on Bidens pilosa var. bimucronata and as they rested in head downward positions on leaves of trees and bushes. The flight is similar to that of most members in the tribe Nymphalini.

158. Hypanartia dione Latreille

SPECIMENS: 1♂, 1♀; 3 mi. NNW Ocotal Chico, 5,000 feet, 15 June 1965, 1♀: Peak Volcán Santa Marta, 5,100 feet, 6 June 1965, 1♂.

This species is rare and found only in the Elfin Woodland on Volcán Santa Marta. Both specimens were collected as they rested on bare soil on ridge slopes that recently had been defoliated by landslides (two additional butterflies were seen in these same areas). The flight is very rapid, erratic, and between two and five feet of the ground.

TRIBE Biblini

159. Biblis hyperia aganisa Boisduval

SPECIMENS: 2♂♂, 7♀♀; 1,100-2,600 feet; 12 March-5 Oct.

This nymphalid is common and found principally along the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest and along Hedgerows. The butterflies seem to prefer partially shaded areas. The flight is very weak, slow, and usually within one or two feet of the ground. The blossoms of Lantana camara are

attractive to the species.

TRIBE Eunicidi

160. Mestra amymone (Ménétriés)

SPECIMENS: 8♂♂, 5♀♀; 500-1,900 feet; 9 June-18 Oct.

The amymone is abundant in the Savanna, Deciduous Woodland and the Pinus-Quercus Associes, Recently Abandoned Milpas, and Pastures and along Hedgerows on the Santa Marta massif but common to uncommon in most other sections of the range. The flight is very slow, weak, and usually between one and three feet of the ground.

161. Pyrrhogyra hypensor Godman & Salvin

SPECIMENS: 2♂♂, 11♀♀; 0-2,700 feet; 16 June-18 Aug.

This butterfly is common along the margins of the Swamp Forest but uncommon in all other formations. Most specimens were collected as they rested on leaves between five and ten feet of the ground along the banks of the Río Carizal. The flight is similar to that of most species in the family.

162. Pyrrhogyra edocla aenaria Fruhstorfer

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 7 Aug. 1962.

This species is rare; the single male was collected as it flew along the sunny driveway of the Hotel Playa Azul. The flight is similar to that of most other nymphalids.

163. Pyrrhogyra otolais neis Felder

SPECIMENS: 7♂♂, 20♀♀; 0-2,500 feet; 19 May-18 Nov.

This butterfly is common and the most common species of Pyrrhogyra in the Sierra; the species is found most commonly in the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, Swamp Forest, Mangrove Woodland, and along Hedge Rows. The butterflies habitually rest on leaves between three and ten feet above the ground. When an individual is disturbed, it flys very rapidly and erratically upward into the canopy but after a few minutes returns to the same perch or to one near by.

164. Pseudonica flavilla canthara (Doubleday)

SPECIMENS: 3♂♂, 6♀♀; 1,100-2,550 feet; 20 Feb.-18 Oct.

This nymphalid is uncommon; all butterflies were found along the margins of the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Hedgerows. The flight is typical of most members of the family.

165. Temenis laothoe liberia (Fabricius)

SPECIMENS: 4♂♂, 6♀♀; 150-1,625 feet; 9 July-19 Oct.

This species is uncommon, being found only along the margins of the Semi-Evergreen Seasonal Forest. When collected, the butterflies were resting on leaves approximately two to five feet above the ground.

166. Epiphile adrasta bandusia Fruhstorfer

SPECIMENS: 3♂♂, 3♀♀; 1,100-2,300 feet; 29 June-30 Oct.

This species is uncommon and found only along the margins of the Semi-Evergreen Seasonal Forest. The butterflies usually rest on the undersurfaces of leaves with the wings held in a horizontal position and the heads downward and protruding just beyond the margins of the leaves. The flight is rapid and erratic.

167. Epiphile plutonia Bates

SPECIMENS: 5♂♂; 2.5 mi. NNW Ocotal Chico, 3,600 feet, 30 March 1965, 1♂: 3 mi. NNW Ocotal Chico, 4,100 feet, 30 July 1963, 1♂; 4,400 feet, 17 June 1963, 1♂; 4,800 feet, 16 July 1963, 2♂♂.

Epiphile plutonia is local, uncommon, and found only in the Montane Thicket on the upper slopes of Volcán Santa Marta. The butterflies were seen most frequently as they chased each other or as they rested on leaves (usually between ten and 20 feet above the ground) in patches of sunlight. The flight is very rapid and erratic. The present data are the only records of this species from Mexico. The nearest recorded locale is the Polochic Valley of Guatemala (Godman & Salvin, 1879-1901).

168. Catonephele nyctimus (Westwood)

SPECIMENS: 13♂♂, 9♀♀; 700-3,750 feet; 9 Feb.-18 Oct.

This dimorphic species is uncommon to common and found in and along the margins of the Semi-Evergreen Seasonal Forest and Lower Montane Rain Forest. The males usually were seen along the margins of the forests whereas the females seemed to prefer the more shaded areas just with the forests. Both males and females fly within a few feet of the ground and usually within dense underbrush. The

flight of the female is slower and weaker than that of the male and is very similar to that of Heliconius charitonius (Heliconiinae) and female Itaballia viardi (Pieridae).

169. Catonephele numilia esite (Felder)

SPECIMENS: 4♂♂, 2♀♀; 1,100-2,700 feet; 7 May-1 Aug.

This dimorphic species is uncommon and found principally in the Lower Montane Rain Forest and the Liquidambar-Quercus Associes of the Montane Rain Forest. The butterflies seem to prefer less disturbed forests than do those of the related species C. nyctimus. The males usually were found along sunny trails within the forests (often visiting mule dung) wheras the females preferred the more shaded areas off the trails. The flight of the female is much slower and weaker than that of the male, which has a typical nymphalid flight.

170. Nessaea aglaura (Westwood & Hewitson)

SPECIMENS: 3♂♂, 4♀♀; 0-1,950 feet; 25 June-24 Sept.

Nessaea aglaura is uncommon in the Sierra; most specimens were collected in trap nets (using mangoes as bait) that were placed in the small patches of Semi-Evergreen Seasonal Forest bordering Lago Catemaco. The flight is characteristic of most members of the family.

171. Myscelia cyaniris Doubleday & Hewitson

SPECIMENS: 4♂♂, 8♀♀; 150-2,000 feet; 7 June-19 Sept.

This nymphalid is uncommon, seasonal, and local; most butterflies were collected in Pastures and the Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco in August and September. The butterflies are attracted to sap oozing from trees.

172. Myscelia rogenhoferi Felder

SPECIMEN: 1♀; 2 mi. NE Catemaco, 1,100 feet, 22 Sept. 1962.

This rare species was collected in a small patch of Semi-Evergreen Seasonal Forest bordering Lago Catemaco. The single female was resting on a small tree trunk when collected.

173. Eunica monima (Stoll)

SPECIMENS: 1♂, 3♀♀; 1,100, 1,800 feet; 6 June-2 Aug.

E. monima is uncommon and found only in Pastures. All butterflies were feeding on the blossoms of Lantana camara when collected.

174. Eunica alcmena alcmena Doubleday & Hewitson

SPECIMENS: 4♂♂; 1,900-2,600 feet; 16 June-12 July.

This Eunica is uncommon and found only in the Deciduous Woodland. All four butterflies were collected as they rested on living oak leaves and dead leaves on the ground. The flightis very rapid and erratic.

175. Catagramma lyca Doubleday & Hewitson

SPECIMENS: 6♂♂, 9♀♀; 2.25 mi. SW Sontecomapan, 800 feet, 14 July 1962, 2♀♀: 2.5 mi. SW Sontecomapan, 800 feet, 16 July 1962, 2♀♀;

900 feet, 15 July 1962, 1♀: 3 mi. SW Sontecomapan, 900 feet, 17 July 1962, 4♂♂: 2.5 mi. NE Tapalapan, 1,500 feet, 31 Aug. 1962, 1♂: 5 mi. E Cuetzalapan, 2,450 feet, 18 Aug. 1962, 1♂, 1♀: 3 mi. NNW Ocotal Chico, 17 June 1963, 1♀; 3 July 1963, 1♀; 4,200 feet, 30 July 1963, 1♀.

This species is locally common and found principally in the Lower Montane Rain Forest. The butterflies were collected most frequently as they rested on the undersurfaces of leaves approximately seven to 12 feet above the ground along relatively wide forest trails. Usually more than one individual was seen at any one locale. The flight is extremely rapid, erratic, and never below five or six feet of the ground. C. lyca has not been recorded previously from Veracruz. The nearest recorded locale is Tabasco (Hoffmann, 1940).

176. Catagramma titania Salvin

SPECIMENS: 6♂♂; 1,100 feet; 25 July-16 Oct.

This nymphalid is uncommon and found only in Pastures and along the margins of the Semi-Evergreen Seasonal Forest in the Catemaco Basin. The flight is very fast and erratic and usually slightly lower than that of C. lyca.

177. Catagramma casta Salvin

SPECIMEN: 1♀; 4 mi. NE Ocotal Grande, 1,200 feet, 9 June 1965.

This species is rare; the single female was collected along a sunny trail within the Lower Montane Rain Forest near the small village of Encinal. Several other specimens were seen at the same locale; these were darting from tree to tree between 15 and 30 feet

above the ground. Thus, of the three species of Catagramma collected, C. casta seems to be the most uncommon and the most inaccessible.

178. Diaethria anna (Guérin)

SPECIMENS: 7♂♂, 12♀♀; 0-3,400 feet; 15 June-30 Oct.

Although common, the species is fairly local. Most butterflies were collected as they rested on leaves approximately three to five feet above the ground along the margins of the Lower Montane Rain Forest and the Semi-Evergreen Seasonal Forest. The butterflies are attracted to moist soil. The flight is very rapid and erratic.

179. Diaethria astala (Guérin)

SPECIMENS: 5♂♂; 1,100, 2,450 feet; 3 Aug.-15 Oct.

This species is uncommon, being found principally in Pastures and along the margins of the Semi-Evergreen Seasonal Forest. The butterflies seem to prefer less forested areas than does D. anna. The flight is similar to that of D. anna.

180. Dynamine mylitta (Cramer)

SPECIMENS: 15♂♂, 16♀♀; 500-2,700 feet; 20 May-14 Sept.

This dimorphic species is abundant in most open, sunny areas regardless of plant formation (except the Montane Rain Forest, Montane Thicket, and Elfin Woodland). The butterflies visit mud puddles very frequently. The flight usually is of moderate velocity

and usually within two feet of the ground.

181. Dynamine dyonis Geyer

SPECIMENS: 3♂♂, 10♀♀; 1,625-2,550 feet; 23 March-28 Oct.

D. dyonis is much less abundant and more local in distribution than the preceding species, being found principally along the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. The flight is similar to that of D. mylitta.

TRIBE Ageroniidi

182. Hamadryas februa gudula (Fruhstorfer)

SPECIMENS: 12♂♂, 6♀♀; 0-2,000 feet; 5 Feb.-23 Oct.

H. februa gudula is common to abundant throughout most of the Sierra, being found most frequently in Pastures and along the margins of all forests. This species (as well as the other five members of the genus) spend most of their time resting on the trunks and limbs of lichen-encrusted trees (particularly Inga spuria) or feeding on fermenting sap oozing from the injured trunks of citrus trees. The butterflies rest head downward and hold their wings in a horizontal position usually flat against the substrate. When changing positions, the butterflies walk with the wings constantly held in the horizontal plane. This resting behavior coupled with the wing coloration render the butterflies very inconspicuous. The butterflies are very "aggressive" and when anyone or any relatively large animal passes near a "perched" butterfly, it usually darts at the moving object making a characteristic clicking noise that can be discerned for distances as great as 50 to 100 feet away. After

pursuing the moving object for a few seconds, the butterfly usually returns to the same tree or another near by. As reported in Ross (1963), territoriality was not demonstratable in this group-- at least not for H. februa gudula and H. g. guatemalena.

183. Hamadryas feronia farinulenta (Fruhstorfer)

SPECIMENS: 6♂♂, 5♀♀; 1,100-2,400 feet; 5 Feb.-23 Oct.

This species is common only in the Deciduous Woodland and the Pinus-Quercus Associes. See comments under H. februa gudula listing for description of behavior.

184. Hamadryas guatemalena guatemalena (Bates)

SPECIMENS: 7♂♂, 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 20 June 1962, 1♂; 25 July 1962, 1♂; 26 July 1962, 1♂; 11 Aug. 1962, 1♂; 28 Aug. 1963, 1♀; 29 Aug. 1963, 1♂ (LSUMZ); 11 Sept. 1962, 1♂; 12 Sept. 1962, 1♀; 3 Oct 1962, 1♂.

Although abundant in Pastures in the vicinity of Lago Catemaco, H. g. guatemalena nonetheless is less common than H. februa gudula. In other sections of the range, the species is only common to uncommon. See comments under H. februa gudula listing for description of behavior. The species was recorded previously from Veracruz only from the "Sierra Madre Oriental" (Hoffmann, 1940).

185. Hamadryas iphthime (Bates)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 12 Sept. 1962.

This single individual was collected as it fed on sap oozing from the trunk of a citrus tree in a pasture. However, because of the close similarity between this species and several others in the

genus, the possibility exists that I overlooked other individuals; thus the species may not be as rare as the data indicate.

186. Hamadryas amphinome mexicana (Lucas)

SPECIMENS: 7♂♂, 4♀♀; 1,100 feet; 20 June-3 Oct.

This species is uncommon but widely distributed throughout the range, being found principally in relatively open areas. The behavior is similar to that of other members of the genus.

187. Hamadryas laodamia laodamia (Cramer)

SPECIMENS: 1♂, 4♀♀; 1,100, 1,900 feet; 11 Aug.-7 Oct.

This Hamadryas is uncommon and found in Pastures. All butterflies were collected as they rested on the trunks of Inga spuria. The behavior is typical of other members of the genus.

188. Marpesia chiron (Fabricius)

SPECIMENS: 11♂, 5♀♀; 1,100-2,450 feet; 29 March-29 Oct.

The many banded dagger wing is abundant in most open, sunny areas and unrestricted to any plant formation; however, the butterflies are more common in the Deciduous Woodland and the Pinus-Quercus Associes. During July 1963, a very large emigration of this species occurred on the Santa Marta massif (perhaps elsewhere, too). At that time hundreds and thousands of individuals were seen each day as they flew between eight and 20 feet of the ground in a northeasterly direction towards the coast. Occasionally several individuals would stop to visit mud puddles and the flowers of Cordia

spinescens. The local inhabitants of the region informed me that this July emigration is an annual event and that it occurs in other parts of the Sierra as well as in the Ocotal region.

189. Marpesia harmonia (Klug)

SPECIMENS: 1♂♂; 5♀♀; 1,100-2,450 feet; 6 June-18 Sept.

This gold and silver species is locally common and found primarily around mud puddles (particularly on the grounds of the Catemaco Bottling Company-- 4.5 mi. NE Catemaco). However, individuals also were netted frequently as they fed on the blossoms of Cordia spinescens and Bidens pilosa var. bimucronata. A sleeping assemblage consisting of approximately 15 butterflies (both males and females) was found at 9:00 A.M. on 6 June 1963 in a ravine within a Bursera-Inga community. The butterflies were resting on the undersurfaces of the leaves of Cecropia mexicana. I returned to the area several days later and periodically throughout the summer but never did I observe another congregation of butterflies. The flight of M. harmonia is relatively rapid, erratic, and usually between six and 15 feet of the ground.

190. Marpesia corita (Westwood)

SPECIMENS: 7♂♂, 3♀♀; 1,800-5,000 feet; 9 Feb.-18 Aug.

This Marpesia is locally common and found primarily along sunny trails in the Lower Montane Rain Forest, Montane Rain Forest and the Liquidambar-Quercus Associes. The butterflies fly very rapidly between one and two feet of the ground and pause frequently to a-

light on soil and rocks.

191. Marpesia petreus (Cramer)

SPECIMENS: 6♂♂, 4♀♀; 0-1,800 feet; 15 May-28 Aug.

The ruddy dagger wing is uncommon and found primarily along Hedgerows in the vicinity of Lago Catemaco. The butterflies were collected most frequently as they rested on leaves approximately three to six feet above the ground. The flight is rapid and erratic.

TRIBE Liminitidi

192. Limenitis (Adelpha) melanthe (Bates)

SPECIMENS: 3♂♂, 2♀♀; 1,100-2,600 feet; 10 March-10 Nov.

This admiral is uncommon and local, most individuals being taken as they engaged in "hill topping" over a sunny knoll in the Pinus-Quercus Associes of the Deciduous Woodland. The flight is fast, erratic and usually above eight feet of the ground.

193. Limenitis (Adelpha) leuceria (Druce)

SPECIMENS: 11♂♂, 3♀♀; 2,100-5,400 feet; 24 March-4 Sept.

This species is common in the Montane Rain Forest, Montane Thicket, and Elfin Woodland. The butterflies usually were collected as they rested on leaves approximately six to 12 feet above the ground along relatively wide, sunny trails. The flight is very rapid, erratic, and usually in excess of six feet of the ground.

194. Limenitis (Adelpha) erotia (Hewitson)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 2 Aug. 1962.

This species is rare; the single male was collected in a trap net (fermenting mangoes being used as bait) in a pasture bordering Lago Catemaco. L. erotia has not been recorded from Veracruz. The nearest recorded locales are "Sur y Oriente de Chiapas" (Hoffmann, 1940).

195. Limenitis (Adelpha) oberthuri (Boisduval)

SPECIMENS: 2♂♂; 3 mi. SW Sontecomapan, 1,600 feet, 1 Oct. 1962, 1♂: 5 mi. E Cuetzalapan, 2,450 feet, 17 Aug. 1962, 1♂.

This admiral is rare and found only in the Lower Montane Rain Forest. Both males were resting on leaves along sunny trails when collected. This species has not been recorded from Mexico. The nearest recorded locale is the Polochic Valley of Guatemala (Godman & Salvin, 1879-1901).

196. Limenitis (Adelpha) iphicla (Linnaeus)

SPECIMENS: 4♂♂, 10♀♀; 900-2,600 feet; 19 June-23 Oct.

Limenitis iphicla is common throughout most of the Sierra and is found along the margins of the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and the Deciduous Woodland (including the Pinus-Quercus Associes). Within the oak and pine-oak communities, L. phicla is the most common species of Limenitis. The flight is rapid, erratic, and usually between six and 12 feet of the ground.

197. **Limenitis** (**Adelpha**) **basiloides** (Bates)

SPECIMENS: 2♂♂, 2♀♀; 30-1,800 feet; 25 July-23 Oct.

This nymphalid is uncommon, being found along Hedgerows and the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest. All four specimens were collected as they rested on leaves approximately five to eight feet above the ground.

198. **Limenitis** (**Adelpha**) **felderi** (Boisduval)

SPECIMENS: 1♂, 1♀; 3.5 mi. SW Sontecomapan, 1,100 feet, 15 July 1962, 1♀: 1.25 mi. NE Ocotal Chico, 2,600 feet, 12 July 1963, 1♂.

This species is rare; the female was collected as it flew about three feet above the ground in a bamboo thicket in the Semi-Evergreen Seasonal Forest, and the male as it rested on a leaf in a partially shaded area of disturbed Lower Montane Rain Forest. Thus, it appears as if this species prefers more shaded and heavily forested areas than do most of the related species.

199. **Limenitis** (**Adelpha**) **sentia** (Godman & Salvin)

SPECIMENS: 2♀♀; 1.75 mi. E Sontecomapan, 0 feet, 6 Aug. 1962, 1♀: 2 mi. NE Catemaco, 1,100 feet, 14 Sept. 1962, 1♀.

This species, like the preceding, is rare and seems to be restricted to Swamp Forest and Pasture plant formations. The flight is similar to that of most nymphalids. The nearest recorded locale is "Península de Yucatán" (Hoffmann, 1940).

200. **Limenitis** (**Adelpha**) **paraeca** (Bates)

SPECIMENS: 5♂♂, 11♀♀; 0-2,500 feet; 10 May-23 Oct.

This admiral is common to abundant and the most common and widespread species of Limenitis in the Sierra. The butterflies are numerous both along the margins of forests and thickets and in pastures. The behavior is similar to that of most other species in the genus.

TRIBE Apaturidi

201. Apatura cherubina (Felder)

SPECIMEN: 1♀; 3 mi. WSW Santiago Tuxtla, 2,100 feet, 30 Aug. 1962.

This species is rare; the single female was collected as it rested on a leaf approximately five feet above the ground beside the dirt road ascending Cerro Tuxtla; the road is bordered by Semi-Evergreen Seasonal Forest.

202. Apatura pavon (Latreille)

SPECIMENS: 1♂, 2♀♀; 1,100 feet; 22-30 July.

Apatura pavon is uncommon and restricted to Pastures. All specimens were collected as they rested on the leaves of shrubs. Disturbed butterflies fly very rapidly but for only short distances (usually eight to 12 feet); they then alight on leaves.

203. Apatura laure (Drury)

SPECIMENS: 2♂♂, 1♀; 500, 1,100 feet; 30 June-22 Aug.

This Apatura is uncommon; one butterfly was collected as it rested on a paved highway, another as it was feeding on the flowers of Cordia spinescens in a pasture, and the third as it was flying

rapidly about three feet above the ground in a pasture.

204. Historis odius (Fabricius)

SPECIMENS: 2♂♂, 3♀♀; 500-1,600 feet; 6 June-1 Oct.

This species is uncommon; most butterflies were collected as they fed on sap oozing from the trunks of citrus trees growing in Pastures in the vicinity of Lago Catemaco. The flight is extremely rapid with powerful wing beats, erratic, and usually in excess of six feet of the ground.

205. Smyrna blomfildia datis Fruhstorfer

SPECIMENS: 9♂♂, 6♀♀; 1,100 feet; 28 July-22 Sept.

Although common in the vicinity of Lago Catemaco, S. blomfildia datis is uncommon elsewhere. All butterflies were netted as they fed on sap oozing from citrus trees growing in Pastures. The flight is extremely rapid, erratic, and usually in excess of six feet of the ground.

206. Gynaecia dirce (Linnaeus)

SPECIMENS: 3♂♂, 8♀♀; 800-1,950 feet; 4 Feb.-24 Sept.

Gynaecia dirce is common only in the Catemaco Basin; most butterflies were collected either as they fed on sap oozing from citrus trees in Pastures or in trap nets in small sections of the Semi-Evergreen Seasonal Forest bordering Lago Catemaco. The flight is similar to that of most members of the family.

TRIBE Charaxidi

207. Prepona demophon centralis Fruhstorfer

SPECIMENS: 8♂♂, 1♀; 900, 1,100 feet; 9 July-1 Nov.

This species is locally common and found primarily in Pastures in the vicinity of Lago Catemaco. The butterflies were collected most frequently as they imbibed fermenting sap oozing from the trunks of citrus trees. The flight of this species (as well as that of the other four species in the genus) is extremely rapid with powerful wing beats, erratic, and usually between six and 15 feet of the ground.

208. Prepona antimache gulina Fruhstorfer

SPECIMENS: 5♂♂, 3♀♀; 900, 1,100 feet; 10 May-8 Oct.

This species is locally common and was collected under the same circumstances as P. demophon centralis.

209. Prepona amphimachus (Fabricius)

SPECIMENS: 5♂♂, 3♀♀; 1,100 feet; 27 July-2 Nov.

This Prepona is locally common and restricted to Pastures in the Catemaco Basin.

210. Prepona laertes pallantias Fruhstorfer

SPECIMENS: 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 14 Sept. 1962, 1♀; 3 Oct. 1962, 1♀.

This nymphalid is rare; both females were collected as they imbibed fermenting sap oozing from citrus tree trunks in Pastures.

211. Prepona brooksiana Godman & Salvin

SPECIMEN: 1♀; 4 mi. N Ocotal Chico, 4,100 feet, 3 Aug. 1963, 1♀.

This large Prepona is rare; the single female was collected in the Montane Thicket on Volcán Santa Marta. It was flying relatively slowly around several small trees as if searching for a suitable site on which to oviposit. Another individual was seen in the same type forest on Volcán San Martín Tuxtla on 26 August 1962. The species is recorded from Veracruz only from Coatepec (Hoffmann, 1940).

212. Anaea (Siderone) marthesia (Cramer)

SPECIMENS: 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 22 July 1962, 1♀; 5 Nov. 1962, 1♀.

This brilliantly colored leaf wing is rare; one butterfly was collected as it flew approximately six feet above the ground through a pasture and another as it fed on fermenting sap oozing from a citrus tree growing in a pasture. The flight is very rapid and erratic. At rest, individuals (of this species as well as all other species in the genus) usually hold their wings in a vertical position so that a distinct break or notch is formed between the two pairs of wings. This behavior enhances the camouflage created by the ventral wing coloration by producing the elusion of a partially frayed leaf.

213. Anaea (Zaretis) itys (Cramer)

SPECIMENS: 2♂♂, 7♀♀; 1,100 feet; 9 Aug.-6 Oct.

This species is locally common and seasonal. Butterflies were collected in two habitats-- Pastures and along Hedgerows in the vi-

cinity of Lago Catemaco. Most butterflies were taken as they imbibed sap oozing from the trunks of citrus trees. The flight is rapid, erratic, and usually between three and five feet of the ground.

214. Anaea (Zaretis) callidryas (Felder)

SPECIMENS: 2♂♂, 3♀♀; 1,100 feet; 7 Sept.- 9 Oct.

This Anaea is uncommon and seasonal; all butterflies were collected during fall and along Hedgerows in the Catemaco Basin. The flight is similar to that of other members of the genus.

215. Anaea (Anaea) aidea Guérin-Ménéville

SPECIMENS: 21♂♂, 16♀♀; 1,100 feet; 21 June-10 Nov.

This leaf wing is abundant throughout the Catemaco Basin but uncommon in all other sections of the Sierra. The butterflies were collected in Pastures, along Hedgerows and the margins of the Semi-Evergreen Seasonal Forest. Croton soliman is the larval food plant. Butterflies collected in late summer (late August) and fall (September-November) are slightly different in coloration-- the dorsal surfaces of the wings are deeper orange and the ventral surfaces are darker brown with more streaking and blotching-- than those collected in early and mid summer. The flight is similar to that of most other members of the genus.

216. Anaea (Consul) fabius (Cramer)

SPECIMENS: 5♂♂, 10♀♀; 150-2,450 feet; 23 July-26 Oct.

This species is locally common and found primarily along the margins of and just within the small sections of disturbed Semi-Evergreen Seasonal Forest bordering Lago Catemaco. Within the shaded and semi-shaded areas of the forest, the butterflies usually fly approximately six feet above the ground with a relatively slow and weak wing beat, which is very atypical for members of the genus but very similar to that of the "tiger complex" of ithomiids and several heliconians-- particularly H. ismenius, the predominant butterfly species within these forests. However, when the butterflies are disturbed or engaged in pursuing each other (as is quite frequently the case when they enter the sunny pastures) the flight becomes typical of that of most members of the genus-- fast, erratic, and with frequent darting motions.

217. Anaea (Consul) electra (Westwood)

SPECIMENS: 11♂♂, 4♀♀; 700-2,950 feet; 22 June-7 Sept.

Anaea electra is locally common, being found principally along the margins of the Semi-Evergreen Seasonal Forest, Lower Montane Rain Forest, and Hedgerows in the Catemaco Basin. However, occasionally butterflies were seen along the borders of the Montane Rain Forest. The flight usually is higher than that of most species of Anaea-- usually in excess of 15 feet of the broud and often near the boles of the tallest trees.

218. Anaea (Memphis) eurypyle confusa Hall

SPECIMENS: 6♂♂, 6♀♀; 800-2,700 feet; 10 March-26 Oct.

This species is locally common and found primarily in the Deciduous Woodland and the Pinus-Quercus Associes. In fact, A. eurypyle confusa is the most common species of Anaea on the Santa Marta massif. The butterflies were seen most frequently on a grassy, shrubby knoll northeast of Ocotal Chico as they rested on stalks of grass and twigs. The flight is very rapid and erratic.

219. Anaea (Memphis) artacaena (Hewitson)

SPECIMEN: 1♀; 1 mi. N Soteapan, 1,400 feet, 14 July 1963.

The single specimen of this rare species was collected as it flew about the flowers of Lindenia rivalis, a common shrub in the streams and creeks on the Santa Marta massif and in the Semi-Evergreen Seasonal Forest.

220. Anaea (Memphis) pithyusa (Felder)

SPECIMENS: 4♂♂, 3♀♀; 1,100-1,900 feet; 14 July-13 Nov.

This species is uncommon. The butterflies were collected in a variety of habitats-- Pastures (as they imbibed fermenting citrus sap), Recently Abandoned Milpas (as they rested on dead branches), and along the margins of the Semi-Evergreen Seasonal Forest (as they rested on sunlit leaves). The behavior is typical of most members of the genus.

221. Anaea (Memphis) proserpina (Salvin)

SPECIMENS: 5♂♂; 3 mi. NNW Ocotal Chico, 4,800 feet, 17 June 1963, 1♂: Peak Volcán Santa Marta, 5,000 feet, 11 June 1963, 2♂♂; 17 June 1963, 1♂; 1 March 1965, 1♂.

Anaea proserpina is uncommon and found only in the Montane Thicket and Elfin Woodland on the upper slopes of Volcán Santa Marta. The butterflies were seen most frequently as they chased each other about in or slightly below the forest canopy; only rarely did an individual descend within netting range. The species has not been recorded from the state. The nearest recorded locale is Chiapas (Comstock, 1961).

222. Anaea (Memphis) morvus boisduvali W.P. Comstock

SPECIMENS: 2♀♀; 9 mi. ENE Sontecomapan, 0 feet, 13 Aug. 1962, 1♀; 14 Aug. 1962, 1♀.

This species is rare. Both females were collected as they rested on tree limbs in the Littoral Woodland near Río Carizal.

SUBFAMILY Libytheinae

223. Libytheana carinenta mexicana Michener

SPECIMENS: 8♂♂, 6♀♀; 1,100-2,100 feet; 23 Oct.-22 Nov.

The Mexican snout butterfly is locally abundant and seasonal, being found primarily in the Pinus-Quercus Associes of the Deciduous Woodland during late fall. Most butterflies were collected as they visited the flowers of Calliandra grandiflora. On several occasions I observed as many as a dozen butterflies on a single plant. The flight is very rapid, erratic and usually between six and 12 feet of the ground.

FAMILY LYCAENIDAE

SUBFAMILY Lycaeninae

TRIBE Theclini

SUBTRIBE Strymoniti

224. Eumaeus minyas Hübner

SPECIMENS: 18♂♂, 14♀♀; 0-2,200 feet; 5 Feb.-30 Oct.

This lycaenid is abundant in the Pinus-Quercus Associes of the Deciduous Woodland and in the Littoral Woodland behind the coast where Piper sp. is common. The butterflies were collected most frequently as they fed on the blossoms of Calliandra grandiflora (in the pine-oak forest) and as they rested on the leaves of Piper sp. (in the Littoral Woodland). The flight is extremely slow, weak, usually between two and eight feet of the ground, and of short duration. When the butterflies were pinched, small droplets of brownish, acrid-smelling liquids were exuded from the terminal portions of the appendages and the wing veins. The larval food plant is Zamia loddigesii var. angustifolia, a common plant in the pine-oak forest. Immature stages are described in Ross (1964d).

225. Eumaeus debora Hübner

SPECIMENS: 15♂♂, 16♀♀; 2 mi. NE Catemaco, 1,100 feet, 30 July 1963, 2♂♂, 1♀: 1.5 mi. SW Margiallanas, 1,500 feet, 5 Aug. 1963, 1♀: 2 mi. WSW Tapalapan, 1,600 feet, 13 Oct. 1962, 3♂♂, 1♀: 1.5 mi. NNE Ocotal Chico, 2,300 feet, 10 July 1963, 1♀: 1 mi. N Ocotal Grande, 3,000 feet, 21 June 1963, 1♀: Peak Volcán San Martín Pajapan, 3,750 feet, 8 June 1965, 1♀: 3 mi. NNW Ocotal Chico, 3,800 feet, 11 June 1963, 1♀; 4,100 feet, 11 June 1963, 1♀. Reared specimens: 3 mi. NNE Ocotal Chico, 3,200 feet, emerged 29 Aug. 1963, 1♂, 1♀: 2 mi. N Ocotal Grande, 3,600 feet, emerged 12 May 1965, 5♂♂, 2♀♀; 13 May 1965, 4♂♂, 3♀♀.

This large lycaenid is locally common in the Montane Rain Forest,

Montane Thicket, and Elfin Woodland during late summer and fall. The butterflies seem to prefer to fly in the relatively bright and open sections of the forest as well as over the peaks of the highest volcanoes. The flight is very similar to that of E. minyas with the exception that E. debora usually flys at higher altitudes, usually between ten and 20 feet of the ground. The larval food plant is Ceratozamia mexicana, a common plant in the rain forests between elevations of 3,000 and 3,500 feet. The life history is described in Ross (1964d). The species has been recorded from Veracruz only from the "Sierra Madre Oriental" (Hoffmann, 1940).

226. Theorema eumenia Hewitson

SPECIMENS: 2♂♂; 1 mi. NNW Ocotal Grande, 1,900 feet, 4 July 1963, 1♂: 3 mi. NNW Ocotal Chico, 2,900 feet, 17 June 1963, 1♂.

This species is rare; one specimen was collected along a small stream in a ravine within the Semi-Evergreen Seasonal Forest, and the other in a ravine within the Lower Montane Rain Forest. Both butterflies were resting on the upper surfaces of leaves along shaded sections of trails when collected.

227. Chlorostrymon simaethis simaethis (Drury)

SPECIMENS: 2♂♂, 1♀; 0.5 mi. S Barrosa, 500 feet, 30 June 1962, 1♀: 4 mi. NE Catemaco, 1,100 feet, 22 July 1962, 1♂: 2 mi. NE Catemaco, 1,100 feet, 4 Oct. 1962, 1♂.

This hairstreak is rare; all three specimens were collected as they fed on Cordia spinescens growing along Hedgerows. The behavior of this species is typical of all the remaining species in the tribe Theclini recorded from the Sierra: first, a flight that is extremely

rapid, erratic, and which tends towards the vertical more than the horizontal; second, a resting position that usually is on the upper surfaces of leaves and during which time the butterflies usually rub their hind wings together together alternately.

228. Chlorostrymon telea (Hewitson)

SPECIMENS: 2♂♂, 1♀; 1,200-2,000 feet; 9 June-1 Aug.

All three specimens of this uncommon species were collected in Pastures as they fed on the blossoms of Cordia spinescens.

229. Calycopis beon (Cramer)

SPECIMENS: 27♂♂, 10♀♀; 0-3,400 feet; 11 Feb.-30 Oct.

The beon hairstreak is the most abundant and widespread species of lycaenid in the Sierra, being found in practically all open and semi-shaded areas. The behavior is similar to that of most members of the family.

230. Calycopis trebula (Hewitson)

SPECIMENS: 5♂♂; 1,700-1,900 feet; 17 May-8 Aug.

This species is locally common and found primarily along the margins of the Semi-Evergreen Seasonal Forest on the Santa Marta massif. All butterflies were collected as they rested on the leaves of trees growing along shaded stream banks.

231. Calycopis pisis (Godman & Salvin)

SPECIMENS: 1♂, 1♀; 2 mi. N Ocotal Grande, 3,700 feet, 21 June 1963, 1♂, 1♀.

This species is rare and restricted to the Liquidambar-Quercus Associes of the Montane Rain Forest. Both specimens were collected as they rested on leaves along a partially shaded trail. Calycopis pisis has not been recorded from Mexico; the nearest recorded locale is Teleman, Guatemala (Godman & Salvin, 1879-1901).

232. Calycopis sp. "C"

SPECIMEN: 1♂; 2 mi. SSW Tibernal, 150 feet, 23 Aug. 1962.

This specimen still remains unclassified. The butterfly was collected along the margin of the Bursera-Sabal-Orbignya Associes of the Semi-Evergreen Seasonal Forest.

233. Tmolus echion echiolus (Draudt)

SPECIMEN: 1♀; 1 mi. NNE Ocotal Chico, 2,100 feet, 14 June 1963.

This hairstreak is rare. The single specimen was collected as it fed on the blossoms of Cordia spinescens that was growing in a Recently Abandoned Milpa.

234. Tmolus crolinus (Butler & Druce)

SPECIMENS: 6♂♂, 2♀♀; 1,100-2,800 feet; 2 June-3 Aug.

Tmolus crolinus is uncommon but relatively widely distributed throughout the range, being found principally along the margins of Hedgerows, the Semi-Evergreen Seasonal Forest, and Deciduous Woodland (including the Pinus-Quercus Associes). The butterflies are attracted to the flowers of Calliandra grandiflora.

235. Tmolus azia (Hewitson)

SPECIMENS: 3♂♂, 4♀♀; 1,100-2,200 feet; 5 Feb.-4 Oct.

This Tmolus is locally common and found primarily on the leaves and flowers of Borreria suaveolens in Pastures and Recently Abandoned Milpas. Although I searched for immature stages, none was found.

236. Oenomaus ortygnus (Cramer)

SPECIMENS: 4♂♂, 4♀♀; 900, 1,100 feet; 17 July-7 Sept.

This lycaenid is locally common. Most butterflies were collected in shaded and semi-shaded areas along the margins of or just within the Semi-Evergreen Seasonal Forest and Lower Montane Rain Forest in the vicinity of Lago Catemaco.

237. Callophrys (Cyanophrys) amyntor distractus Clench

SPECIMENS: 1♂, 5♀♀; 700-1,800 feet; 20 June-18 Oct.

This species is uncommon and local. Most specimens were collected as they rested on the leaves of trees and shrubs growing along the margins of the Lower Montane Rain Forest and the Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco. The behavior is the same as that of other species in the tribe.

238. Callophrys (Cyanophrys) herodotus (Fabricius)

SPECIMENS: 3♂♂, 3♀♀; 0-2,200 feet; 22 April-18 Sept.

Callophrys herodotus is uncommon and found along the margins of the Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and

Swamp Forest.

239. Callophrys (Cyanophrys) leucania (Hewitson)

SPECIMEN: 1♀; 1 mi. N Ocotal Grande, 2,300 feet, 15 May 1965.

The single female of this rare species was collected as it fed on the blossoms of Calliandra grandiflora growing in the Pinus-Quercus Associes of the Deciduous Woodland.

240. Callophrys (Cyanophrys) miserabilis (Clench)

SPECIMENS: 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 15 Sept. 1962.

Both females of this rare species were collected as they fed on the blossoms of Crotalaria vitellina, which was growing in a Hedgerow.

241. Callophrys (Cyanophrys) goodsoni Clench

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 7 Sept. 1962.

The single male was collected as it fed on the blossoms of Cordia spinescens in a Pasture.

242. Callophrys (Cyanophrys) agricolor agricolor (Butler & Druce)

SPECIMEN: 1♂: Peak.Volcán Santa Marta, 5,200 feet, 6 April 1965.

The single specimen of this rare species was collected as it flew over the crater rim of Volcán Santa Marta. The flight is very rapid and erratic.

243. Callophrys (Cyanophrys) nr. longula (Hewitson)

SPECIMEN: 1♀; Peak Volcán Santa Marta, 5,100 feet, 26 May 1965.

This species is rare. The single female was collected as it flew over the peak of Volcán Santa Marta and above the canopy of the Elfin Woodland. Although there are similarities between this female and those of C. longula, there are several differences. In addition, C. longula is restricted to South America-- Ecuador, Bolivia, Colombia, and Venezuela (Godman & Salvin, 1879-1901). Therefore, the female from the Sierra probably represents a new species.

244. Atlides polybe (Linnaeus)

SPECIMEN: 1♂; 3 mi. SW Sontecomapan, 900 feet, 17 July 1962.

Atlides polybe is rare in the Sierra. The single male was collected as it fed on the blossoms of Cordia spinescens in a Pasture.

245. Panthiades ochus (Godman & Salvin)

SPECIMEN: 1♂; 3 mi. SW Sontecomapan, 900 feet, 17 July 1962.

The single specimen was collected as it fed on the blossoms of Cordia spinescens, which was growing in a Hedgerow.

246. Strymon melinus Hübner

SPECIMENS: 6♂♂, 9♀♀; 0.25 mi. SSE Ocotal Chico, 1,700 feet, 8 June 1963, 1♀: 0.5 mi. SSE Ocotal Chico, 1,800 feet, 23 June 1963, 1♀: Ocotal Chico, 1,900 feet, 15 May 1965, 1♀; 7 July 1963, 1♂; 28 Oct. 1962, 2♂♂: 1 mi. NNE Ocotal Chico, 2,100 feet, 14 June 1963, 1♂: 5 mi. NNE Catemaco, 2,200 feet, 4 July 1962, 1♂: 1 mi. N Ocotal Grande, 2,300 feet, 15 May 1965, 3♀♀: 1 mi. NNW Ocotal Chico, 2,300 feet, 3 July 1963, 1♀: 1.5 mi. NNW Ocotal Chico, 2,350 feet, 15 June 1963, 1♀: 1.25 mi. NE Ocotal Chico, 2,600 feet, 10 May 1965, 1♂; 2,700 feet, 28 July 1963, 1♀.

The grey hairstreak is locally common. Most specimens were collected as they fed on the blossoms of Calliandra grandiflora in the Pinus-Quercus Associes of the Deciduous Woodland. The behavior is the same as that of other members of the tribe. Strymon melinus has not been recorded from Veracruz. The nearest recorded locale is Oaxaca (Hoffmann, 1940).

247. Strymon yojoa (Reakirt)

SPECIMENS: 10♂♂, 14♀♀; 500-5,000 feet; 11 Feb.-26 July.

This species is abundant throughout most open and semi-open areas throughout the Sierra. The butterflies are attracted to many species of flowering plants.

248. Strymon columella istapa (Reakirt)

SPECIMENS: 4♂♂; 1,100-2,700 feet; 12 May-10 Oct.

The columella hairstreak is uncommon. All butterflies were collected as they visited the blossoms of Calliandra grandiflora in Hedgerows and the Pinus-Quercus Associes of the Deciduous Woodland.

249. Strymon bazochii (Godart)

SPECIMENS: 3♂♂, 1♀; 1,100-2,200 feet; 7 June-21 Aug.

The bazochii hairstreak is uncommon and found in Pastures, the Pinus-Quercus Associes of the Deciduous Woodland, and along Hedgerows.

250. Strymon albata sedecia (Hewitson)

SPECIMENS: 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 9 Aug. 1962, 1♀; 21 Aug. 1962, 1♀.

Both individuals of this rare species were collected along the margins of the Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco.

251. Strymon serapio Godman & Salvin

SPECIMENS: 2♂♂, 1♀; 2,200, 2,500 feet; 10 March, 28 June.

This species is uncommon. All butterflies were collected as they fed on the blossoms of Calliandra grandiflora in the Deciduous Woodland.

252. Electrostrymon cyphara (Hewitson)

SPECIMENS: 5♂♂, 10♀♀; 700-2,700 feet; 15 June-15 Sept.

Electrostrymon cyphara is locally common, being found primarily in the Pinus-Quercus Associes of the Deciduous Woodland and along the margins of the Semi-Evergreen Seasonal Forest and Lower Montane Rain Forest. The behavior is typical of that of other members in the tribe.

253. Cycnus battus jalan (Reakirt)

SPECIMENS: 9♂♂, 3♀♀; 0-2,700 feet; 14 March-29 Oct.

This lycaenid is common. Most butterflies were collected as they fed on the blossoms of Cordia spinescens in Pastures and along Hedgerows.

254. Arawacus aetolus togarna (Hewitson)

SPECIMENS: 2♂♂, 1♀; 800-1,900 feet; 14 June-23 July.

This white hairstreak is uncommon and found primarily along the margins of the Lower Montane Rain Forest and Semi-Evergreen Seasonal Forest.

255. Arawacus sito (Boisduval)

SPECIMENS: 1♂♂, 9♀♀; 900-3,200 feet; 18 March-18 Nov.

Arawacus sito is common and found most frequently on the blossoms of Cordia spinescens in Pastures and along Hedgerows.

256. Heterosmaitia palegon (Cramer)

SPECIMENS: 6♂♂, 9♀♀; 700-2,700 feet; 27 April-15 Sept.

This species is common and widely distributed throughout the Sierra, being found in most open and sunny areas irrespective of plant formation.

257. Allosmaitia pion (Godman & Salvin)

SPECIMENS: 2♂♂, 3♀♀; 1,100-2,400 feet; 6 June-21 Aug.

This lycaenid is uncommon. All butterflies were collected as they fed on the flowers of Cordia spinescens in Pastures and the Pinus-Quercus Associes of the Deciduous Woodland.

258. Evenus regalis (Cramer)

SPECIMEN: 1♀; 2 mi. NE Catemaco, 1,100 feet, 28 Aug. 1963.

The single female of this rare species was collected as it fed on the flowers of Cordia spinescens in a Pasture.

259. Thecla cypria (Geyer)

SPECIMEN: 1♀; 2 mi. SW Sontecomapan, 900 feet, 12 July 1962.

This species is rare. The single female was collected as it fed on an unidentified composite in a Pasture.

260. Thecla marsyas damo (Druce)

SPECIMENS: 4♂♂, 10♀♀; 0-2,300 feet; 23 June-7 Sept.

This hairstreak is common, particularly in the Catemaco Basin. The butterflies were seen most frequently along the margins of the Semi-Evergreen Seasonal Forest and Hedgerows. The behavior is the same as that of most other members of the family.

261. Thecla augustula Kirby

SPECIMEN: 1♂; 1.5 mi. NNW Ocotal Grande, 1,800 feet, 4 July 1963.

The single male was collected as it rested on an oak leaf approximately six feet above the ground in the Pinus—Quercus Associes of the Deciduous Woodland.

262. Thecla lisus Stoll

SPECIMENS: 2♂♂; 1 mi. N Soteapan, 1,400 feet, 14 July 1963.

This hairstreak is rare; both males were collected as they rested on leaves of Lindenia rivalis, a common plant in the shallow streams within the Semi-Evergreen Seasonal Forest on the Santa Marta massif.

263. Thecla mavors (Hübner)

SPECIMENS: 5♂♂, 1♀; 1,100-2,700 feet; 11 Feb.-26 June.

This species is uncommon and found principally along the margins of the Liquidambar-Quercus Associes of the Montane Rain Forest and Hedgerows on the Santa Marta massif. Most butterflies were collected as they rested on leaves approximately two to five feet above the ground.

264. Thecla inachus carpophora Hewitson

SPECIMENS: 2♂♂; 2 mi. SW Sontecomapan, 1,100 feet, 23 July 1962, 1♂: 2 mi. NE Catemaco, 1,100 feet, 28 Aug. 1963, 1♂.

This rare species was collected in small patches of Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco. Both butterflies were collected as they rested on leaves along shaded trails.

265. Thecla neora Hewitson

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 29 Aug. 1963.

The single male was collected as it fed on the blossoms of Cordia spinescens in a Hedgerow.

266. Thecla laothoe Godman & Salvin

SPECIMEN: 1♂; Peak Volcán Santa Marta, 5,200 feet, 6 April 1965.

The single male was collected as it flew over the crater rim of Volcán Santa Marta and above the canopy of the Elfin Woodland.

267. Thecla barajo Reakirt

SPECIMENS: 1♂, 2♀♀; 900-2,700 feet; 21 April-30 Aug.

Thecla barajo is rare; all specimens were collected as they fed on the blossoms of Cordia spinescens growing in Hedgerows.

268. Thecla janias (Cramer)

SPECIMENS: 2♀♀; 2 mi. NE Catemaco, 1,100 feet, 21 Aug. 1962, 1♀: 1 mi. NNE Ocotal Chico, 2,000 feet, 31 May 1965, 1♀.

This species is rare. Both females were collected as they fed on the flowers of Cordia spinescens in Pastures.

269. Thecla hassan (Stoll)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 21 Aug. 1962.

The single male was collected as it fed on the blossoms of Cordia spinescens in a Hedgerow.

270. Thecla meton (Cramer)

SPECIMENS: 7♂♂, 2♀♀; 800-1,900 feet; 28 June-26 Sept.

Thecla meton is common in most Pastures and along most Hedgerows throughout the Sierra. The behavior is similar to that of other members of the tribe.

271. Thecla janthina janthodonia Dyar

SPECIMENS: 3♂♂, 1♀; 1,100 feet; 25 July-17 Sept.

This lycaenid is uncommon and found principally along Hedgerows and in Pastures in the vicinity of Lago Catemaco. The butterflies are attracted to the blossoms of Cordia spinescens.

272. Thecla nr. polibites (Cramer)

SPECIMEN: 1♂; Ocotal Chico, 1,900 feet, 22 June 1963.

The single male of this rare species was collected as it rested on a leaf of a small tree growing along the bank of a stream in the

Semi-Evergreen Seasonal Forest. The single specimen is worn and so the determination cannot be definite.

273. Thecla vibidia Hewitson

SPECIMEN: 1♀; 2 mi. NE Catemaco, 1,100 feet, 28 Aug. 1963.

The single specimen was collected as it fed on the blossoms of Cordia spinescens in a Pasture along the southwest shore of Lago Catemaco.

274. Thecla hecate Godman & Salvin

SPECIMENS: 1♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 24 Sept. 1962, 1♀: 5 mi. NNE Catemaco, 2,200 feet, 4 July 1962, 1♂.

This hairstreak is rare. Both specimens were collected as they fed on the flowers of Cordia spinescens in Pastures.

275. Thecla jebus (Godart)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 2 July 1962.

Thecla jebus is rare. The single specimen was collected as it rested on a leaf along the margin of a small section of Semi-Evergreen Seasonal Forest bordering Lago Catemaco.

276. Thecla brescia Hewitson

SPECIMENS: 3♂♂, 8♀♀; 1,100-2,400 feet; 17 March-4 Oct.

This lycaenid is locally common and restricted to the Deciduous Woodland including the Pinus-Quercus Associes. Most butterflies were collected as they fed on the blossoms of Calliandra grandiflora.

277. Thecla ligurina Hewitson

SPECIMEN: 1♀; 2 mi. NE Catemaco, 1,100 feet, 27 June 1962.

The single specimen of this rare species was collected as it rested approximately seven feet above the ground on the leaf of Inga spuria in a Pasture.

278. Thecla mycon Godman & Salvin

SPECIMENS: 7♂♂, 3♀♀; 1,100 feet; 20 June-5 Nov.

Thecla mycon is common only in the Catemaco Basin. Most butterflies were collected as they rested on leaves in shaded or partially shaded areas along the margins of Hedgerows and the Semi-Evergreen Seasonal Forest. The behavior is characteristic of other members of the tribe.

279. Thecla thales (Fabricius)

SPECIMENS: 2♀♀; 3 mi. NNW Ocotal Chico, 2,900 feet, 9 Feb. 1965, 1♀; 3 July 1963, 1♀.

Both specimens of this rare species were collected as they rested on leaves approximately nine feet above the ground along the margin of the Liquidambar-Quercus Associes of the Montane Rain Forest.

280. Thecla tephraeus (Geyer)

SPECIMENS: 5♂♂, 3♀♀; 800-2,500 feet; 16 June-22 Aug.

This hairstreak is common and relatively widely distributed throughout the Sierra, being found principally in Pastures and along Hedgerows where Cordia spinescens was growing.

281. Thecla syncellus syncellus (Cramer)

SPECIMENS: 3♂♂, 5♀♀; 0-1,900 feet; 29 June-29 Aug.

Although uncommon, this species is fairly widely distributed throughout the Sierra. Most butterflies were collected as they rested on leaves along the partially shaded margins of the Semi-Evergreen Seasonal Forest and Hedgerows.

282. Thecla minthe Godman & Salvin

SPECIMEN: 1♀; 5 mi. NNE Catemaco, 2,200 feet, 4 July 1962.

The single female was collected as it rested on a leaf approximately three feet above the ground in a relatively dense section of Lower Montane Rain Forest.

283. Thecla empusa Hewitson

SPECIMEN: 1♂, 2♀♀; 2,200, 2,700 feet; 16 June-1 July.

Thecla empusa is uncommon and restricted to the Deciduous Woodland and the Liquidambar-Quercus Associes of the Montane Rain Forest on the southern slopes of Volcán Santa Marta. All butterflies were collected as they rested on sunlit leaves.

284. Thecla ares Godman & Salvin

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 28 Sept. 1962.

The single specimen was collected as it fed on the blossoms of the composite Bidens pilosa var. bimucronata in a Pasture. Thecla ares has not been recorded from Mexico. The nearest recorded locale is Guatemala (Godman & Salvin, 1879-1901).

285. Thecla ahola Hewitson

SPECIMENS: 3♀♀; 1,900-5,100 feet; 26 May-24 Oct.

Although uncommon, this species nevertheless was collected in a variety of habitats-- Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Elfin Woodland. The behavior is characteristic of other members of the tribe.

286. Thecla gabatha Hewitson

SPECIMEN: 1♀; 0.25 mi. SE Ocozotepec, 1,950 feet, 1 Aug. 1963.

This single specimen of this rare species was collected as it rested on a leaf of an oak tree within the Pinus-Quercus Associes of the Deciduous Woodland. The butterfly is unusually dark and possibly represents an endemic subspecies.

287. Thecla tarpa Godman & Salvin

SPECIMENS: 2♀♀; 3 mi. NNW Ocotal Chico, 3,000 feet, 10 June 1963.

This rare species is restricted to the Liquidambar-Quercus Associes of the Montane Rain Forest. Both specimens were collected as they rested on leaves along partially shaded trails.

288. Thecla maeonis Godman & Salvin

SPECIMEN: 1♂; 1.5 mi. NNE Ocotal Chico, 2,700 feet, 11 Feb. 1965.

This species is rare. The male was collected as it fed on the flowers of Calliandra grandiflora in the Deciduous Woodland.

289. Thecla hesperitis (Butler & Druce)

SPECIMEN: 1♀; 2 mi. NE Catemaco, 1,100 feet, 23 June 1962.

The single female of this rare species was collected as it fed on the blossoms of Cordia spinescens in a Hedgerow.

290. Thecla denarius (Butler & Druce)

SPECIMENS: 8♂♂, 2♀♀; 1 mi. NE Ocotal Chico, 2,500 feet, 10 March 1965, 3♂♂, 1♀; 12 March 1965, 1♂: 1.5 mi. NNW Ocotal Chico, 2,700 feet, 15 June 1965, 2♂♂, 1♀: 2 mi. NNW Ocotal Chico, 2,800 feet, 27 March 1965, 1♂.

This species is locally common within the Pinus-Quercus Associes of the Deciduous Woodland. All butterflies were collected as they flew about the terminal shoots of the branches of pine trees during the spring months. The butterflies seemed to prefer the relatively high branches of the trees and only rarely did they alight on branches lower than 12 feet of the ground. Although I visited these same locales (and trees) during the summer months, no individuals were observed later than June 15; thus, it appears as if the species is either single or double brooded.

291. Thecla plusios Godman & Salvin

SPECIMENS: 3♂♂, 2♀♀; 1,800-5,000 feet; 15 June-30 Oct.

Thecla plusios is locally common and found primarily in the Montane Rain Forest and to a lesser extent in the Montane Thicket and Elfin Woodland. The butterflies prefer sunny glades within the forests.

292. Thecla clarina Hewitson

SPECIMENS: 7♂♂, 5♀♀; 1,800-3,000 feet; 11 Feb.-23 Oct.

This lycaenid is locally common, being found primarily in

the flowers of Calliandra grandiflora within the Pinus-Quercus Associes of the Deciduous Woodland.

293. Thecla demonassa Hewitson

SPECIMENS: 6♂♂, 2♀♀; 1,100-2,700 feet; 16 June-14 July.

This small hairstreak is locally common and found principally along Hedgerows and the margins of the Semi-Evergreen Seasonal Forest on the Santa Marta massif.

294. Thecla tera Hewitson

SPECIMEN: 1♂; 1 mi. SSW Peak Volcán San Martín Tuxtla, 2,300 feet, 27 Aug. 1962.

This species is rare. The single male was collected as it flew approximately five feet above the ground in a sunny glade within the Lower Montane Rain Forest. Thecla tera has not been recorded from Veracruz. The nearest recorded locale is Chiapas (Hoffmann, 1940).

295. Thecla coronata Hewitson

SPECIMEN: 1♂; 1 mi. SE Sontecomapan, 700 feet, 14 July 1962.

The single male was collected as it rested on a leaf along the margin of the Lower Montane Rain Forest.

296. Thecla scopas Godman & Salvin

SPECIMENS: 1♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 27 June 1962, 1♀: 1 mi. S Coyame, 1,200 feet, 25 June 1962, 1♂.

Both specimens of this rare species were collected as they

rested on unidentified bushes in Pastures bordering Lago Catemaco.

297. Thecla mathewi Hewitson

SPECIMEN: 1♂; Ocotal Chico, 1,900 feet, 30 June 1963.

The single male of this rare species was collected as it fed on the blossoms of Jatropha curcas, a tree that was growing in the back yard of a local villager in Ocotal Chico.

298. Thecla politus Druce

SPECIMEN: 1♀; 2 mi. N Ocotal Grande, 3,500 feet, 21 June 1963.

The single specimen was collected as it rested approximately seven feet above the ground on the trunk of a tree that was growing along a trail in a section of Montane Rain Forest. One other butterfly of this species was seen on the same tree trunk but was not collected. Thecla politus has not been recorded from Veracruz. Hoffmann (1940) gives the Mexican distribution as the Pacific coast as far north as the state of Colima.

299. Thecla basalides (Geyer)

SPECIMENS: 4♂♂, 1♀; 1,500-2,500 feet; 11 June-12 Aug.

Thecla basalides is locally common and found principally in the Deciduous Woodland and the Pinus-Quercus Associes. The butterflies were collected most frequently as they fed on the flowers of Calliandra grandiflora.

300. Thecla mulucha Hewitson

SPECIMEN: 1♂; 3 mi. WSW Santiago Tuxtla, 2,700 feet, 30 Aug. 1962.

The single male was collected as it rested on the leaf of a tree along the partially shaded margin of the Semi-Evergreen Seasonal Forest near the peak of Cerro Tuxtla. Thecla mulucha has not been recorded from Mexico. The nearest recorded locale is the Polochic Valley of Guatemala (Godman & Salvin, 1879-1901).

301. Thecla ambrax Westwood & Hewitson

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 28 Aug. 1963.

This species is rare. The single male was collected as it fed on the blossoms of Cordia spinescens along a Hedgerow. Clench (personal communication) states that the specimen is different from those of the nominate subspecies in South America. Thecla ambrax has not been recorded from Mexico. The nearest recorded locale is Chontales, Nicaragua (Godman & Salvin, 1879-1901).

302. Thecla dodava Hewitson

SPECIMEN: 1♂; 3 mi. NNW Ocotal Chico, 3,300 feet, 30 July 1963.

The single specimen was collected as it rested on a leaf approximately five feet above the ground in a sunny glade within an extensive area of Montane Rain Forest. Thecla dodava has not been recorded from Mexico. The nearest recorded locale is Chiriqui, Panamá (Godman & Salvin, 1879-1901).

303. Thecla kalikimaka Clench

SPECIMENS: 2♂♂; 2 mi. NNE Catemaco, 1,100 feet, 28 Aug. 1963, 1♂: o.25 mi. S Ocotal Chico, 1,800 feet, 12 Aug. 1963, 1♂.

This lycaenid is rare. Both specimens were taken as they fed on the blossoms of Cordia spinescens in Pastures.

304. Thecla tamos Godman & Salvin

SPECIMENS: 2♂♂; 1 mi. NNW Ocotal Chico, 2,300 feet, 3 July 1963, 1♂: 2 mi. N Ocotal Grande, 3,500 feet, 21 June 1963, 1♂.

This hairstreak is rare. One specimen was collected in the Deciduous Woodland and the other in the Montane Rain Forest on the Santa Marta massif. Both specimens were resting on leaves in sunny glades. Thecla tamos has not been recorded from Mexico. The nearest recorded locale is Costa Rica (Godman & Salvin, 1879-1901).

305. Thecla nr. antincus Felder

SPECIMEN: 1♂; 1 mi. E Zapoapan, 0 feet, 19 May 1965.

The single specimen was collected as it rested on a leaf approximately 12 feet above the ground along the margin of the Swamp Forest along Río Mescalapan. Although the specimen resembles those of T. antincus, there are slight differences. In addition, T. antincus is known only from South America (Seitz, 1923). Thus, it appears as if the specimen from the Sierra represents an unidentified endemic species.

TRIBE Plebejini

306. Hemiargus (Hemiargus) ceraunus zachaeina (Butler & Druce)

SPECIMENS: 37♂♂, 12♀♀; 0-2,300 feet; 6 June-15 Aug.

This blue is abundant in most open, sunny areas throughout

most of the Sierra irrespective of plant formation. The butterflies fly relatively slowly, close to the ground, and visit flowers-- particularly Oxalis neaeii, an abundant plant in the oak and pine-oak forests-- and mud puddles very frequently.

307. Hemiargus (Echinargus) huntingtoni hannoides Clench

SPECIMENS: 15♂♂, 5♀♀; 350-2,350 feet; 6 June-4 Oct.

This blue is common only in the Savanna, Deciduous Woodland, and the Pinus-Quercus Associes. The butterflies were collected most frequently as they flew relatively slowly and close to the ground in partially shaded, grassy glades. Thus, H. huntingtoni hannoides is less widely distributed than is the sibling H. ceraunus zachaeina and only partially sympatric with it.

308. Hemiargus (Echinargus) isola isola (Reakirt)

SPECIMEN: 1♂; Ocotal Chico, 1,900 feet, 5 Feb. 1965.

Only one specimen of this species was collected. The butterfly was found along a sunny trail within the Pinus-Quercus Associes of the Deciduous Woodland. Although the data indicate that the species is rare, the conclusion may be erroneous for it is possible that numerous individuals were overlooked because of the species' close similarity to both H. ceraunus zachaeina and H. huntingtoni hannoides.

309. Everes comyntas comyntas (Godart)

SPECIMENS: 10♂♂, 8♀♀; 1,100-2,300 feet; 6 Feb.-23 Oct.

The eastern tailed blue is common to abundant in most open, sunny areas throughout the Sierra. The butterflies fly relatively slowly, close to the ground, and are attracted to the flowers of a variety of plant species as well as mud puddles.

310. Leptotes cassius striata (Edwards)

SPECIMENS: 11♂♂, 10♀♀; 1,100-5,100 feet; 11 Feb.-7 Sept.

The cassius blue is abundant in most open, sunny areas. The butterflies are attracted to flowers and mud puddles. The flight is relatively slow and within two feet of the ground. Within the Catemaco Basin, I observed females ovipositing on Crotalaria vitellina, a common plant in fields and pastures.

311. Celastrina argiolus gozora (Boisduval)

SPECIMENS: 7♂♂, 1♀; 1,800-5,400 feet; 24 March-25 Aug.

The spring azure is common on the peaks of the two highest volcanoes. The butterflies frequently were seen as they flew above the ridges and as they rested on leaves in the canopy of the Elfin Woodland. The flight is relatively weak but moderate in velocity.

FAMILY RIODINIDAE

SUBFAMILY Euselasiinae

TRIBE Euselasiini

312. Euselasia sergia (Godman & Salvin)

SPECIMENS: 2♂♂; Ocotal Grande, 1,800 feet, 15 May 1965, 1♂: Ocotal Chico, 1,900 feet, 17 April 1965, 1♂.

This metalmark is rare. Both specimens were collected along the margins of the Semi-Evergreen Seasonal Forest on the southern slopes of Volcán Santa Marta. The behavior of this species is typical of most members in the family: first, a fast erratic flight that usually is of relatively short duration; and second, a resting position usually on the undersurfaces of leaves with the wings held in a horizontal position.

313. Euselasia hieronymia (Godman & Salvin)

SPECIMENS: 6♂♂, 3♀♀; 1,100-4,300 feet; 24 March-30 Oct.

Euselasia hieronymia is locally common. Most butterflies were collected in the Liquidambar-Quercus Associes of the Montane Rain Forest, Semi-Evergreen Seasonal Forest, and Montane Rain Forest on the Santa Marta massif above the villages of Ocotal Chico and Ocotal Grande. The behavior is similar to that of E. sergia.

314. Euselasia cheles aurantiaca (Godman & Salvin)

SPECIMENS: 11♂♂, 2♀♀; 2,300-5,400 feet; 24 March-25 Aug.

This large Euselasia is locally common in the Montane Thicket and Elfin Woodland on the two highest volcanoes. The flight is

extremely erratic and usually in excess of six feet of the ground.

315. Euselasia cataleuca (Felder)

SPECIMENS: 6♂♂, 1♀; 1,150-3,00 feet; 1 Sept.-30 Oct.

This species is uncommon, local, and seasonal. Most butterflies were collected along wide, sunny trails within the Lower Montane Rain Forest on the southern slopes of Volcán San Martín Tuxtla. The species seems to prefer low, damp areas, particularly where Boehmeria sp. is growing. The flight is extremely erratic and usually in excess of five feet of the ground.

316. Euselasia pusilla (Felder)

SPECIMENS: 1♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 22 July 1962, 1♀; 30 Sept. 1962, 1♂.

Both individuals of this rare species were collected in a coffee finca within the Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco.

317. Euselasia eubule (Felder)

SPECIMEN: 1♂; 8 mi. SSE Catemaco, 1,900 feet, 13 Nov. 1962.

The single specimen was collected in a partially shaded section of Semi-Evergreen Seasonal Forest.

SUBFAMILY Riodininae

TRIBE Riodinini

318. Hades noctula Westwood

SPECIMENS: 1♂, 3♀♀; 1,800-2,400 feet; 13 March-8 June.

This riodinid is uncommon. All specimens were collected along streams in ravines within the Semi-Evergreen Seasonal Forest on the southern slopes of Volcán Santa Marta. The flight is very slow, weak, and usually between four and eight feet of the ground.

319. Perophthalma tullius lasius Stichel

SPECIMEN: 1♂; 0.5 mi. N Ocotal Grande, 2,100 feet, 21 June 1963.

The single specimen of this rare species was collected as it rested on the uppersurface of a leaf along a shaded trail within the Liquidambar-Quercus Associes of the Montane Rain Forest. Perophthalma tullius lasius has not been recorded from Veracruz. The nearest recorded locale is Chiapas (Hoffmann, 1940).

320. Leucochimona philemon nivalis (Godman & Salvin)

SPECIMENS: 3♂♂, 4♀♀; 800-2,100 feet; 10-29 July.

This white metalmark is uncommon and is found primarily in the interiors of the Lower Montane Rain Forest. The butterflies were netted most frequently as they rested on the ground with the wings held in a horizontal position. The flight is extremely slow, weak, and usually within two or three feet of the ground.

321. Leucochimona vestalis vestalis (Bates)

SPECIMENS: 6♀♀; 0.5 mi. NNE Ocotal Chico, 2,200 feet, 1 July 1963, 1♀: 2 mi. SSW Peak Volcán San Martín Tuxtla, 2,200 feet, 24 July 1962, 1♀: 5 mi. E Cuetzalapan, 2,450 feet, 18 Aug. 1962, 1♀; 2,500 feet, 4 Sept. 1962, 1♀: S slope Volcán San Martín Tuxtla, 4,300 feet, 25 Aug. 1962, 1♀; 4,750 feet, 25 Aug. 1962, 1♀.

This species is uncommon, being found mainly in the interiors

of the Montane Rain Forest and the Lower Montane Rain Forest (only at the upper limits). This species has not been recorded from the state. The nearest recorded locale is Chiapas (Hoffmann, 1940).

322. Mesosemia tetrica Stichel

SPECIMENS: 11♂♂, 4♀♀; 500-2,300 feet; 30 June-23 Oct.

This metalmark is locally common and is found principally in disturbed areas of Semi-Evergreen Seasonal Forest. The butterflies usually were found in very restricted areas (uaually along trails) within the forests and so the species apparently is colonial. The flight is slower and less erratic than that of most species of riodinids but similar to that of the small species of satyrids (Euptychia spp.). The butterflies rest on the undersurfaces of leaves with the wings held in a horizontal position and on the uppersurfaces of leaves with the wings held at a 45° angle.

323. Mesosemia gaudiolus Bates

SPECIMENS: 20♂♂, 2♀♀; 500-3,000 feet; 1 March-19 Oct.

Mesosemia gaudiolus is locally common and found primarily in the relatively low and damp areas of the Lower Montane Rain Forest and Montane Rain Forest. The species appears to be colonial although the colonies are less restricted than those of M. tetrica. The resting behavior is identical with that of M. tetrica.

324. Eurybia lycisca Westwood

SPECIMENS: 2♂♂; 4.5 mi. ESE Sontecomapan, 75 feet, 6 Aug. 1962.

Both specimens of this rare species were collected at 6:30 P.M. in a dark, dense patch of Swamp Forest bordering Río Yougualtajapan. The butterflies were chasing each other approximately two feet above the ground.

325. Cremma umbra (Boisduval)

SPECIMENS: 6♂♂, 2♀♀; 1,100-2,900 feet; 24 June-20 Nov.

Cremma umbra is uncommon and local. Most butterflies were collected as they rested on the undersurfaces of leaves along the margins of Hedgerows and the Semi-Evergreen Seasonal Forest.

326. Ancylusis jurgensenii (Saunders)

SPECIMEN: 1♂; 1 mi. E Zapoapan, 0 feet, 19 May 1965.

Only one specimen of this large riodinid was collected. The butterfly was found in a Pasture.

327. Rhetus arcius thia (Morisse)

SPECIMENS: 4♂♂, 1♀; 1,100-1,800 feet; 17 July-16 Sept.

This tailed metalmark is uncommon, being found primarily along the margins of the Semi-Evergreen Seasonal Forest in the vicinity of Lago Catemaco.

328. Isapis agyrtus hera Godman & Salvin

SPECIMEN: 1♂; 1 mi. ENE Ocotal Chico, 1,700 feet, 17 June 1965.

This little butterfly is rare and was collected along a thicket within the Pinus-Quercus Associes of the Deciduous Woodland. The species

has not been recorded from Veracruz. The nearest recorded locale is Chiapas (Godman & Salvin, 1879-1901).

329. Notheme eumeus diadema Stichel

SPECIMEN: 1♂; 9 mi. SSE Catemaco, 1,800 feet, 23 June 1962.

The single specimen was collected as it rested on the undersurface of a leaf of a coffee plant in a coffee finca located in the Semi-Evergreen Seasonal Forest.

330. Calephelis fulmen (Stichel)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet; 12 Aug. 1962.

This little metalmark is rare (although numerous other individuals may have been overlooked because of the species' similarity to other species of Calephelis). The butterfly was collected in a Pasture bordering Lago Catemaco. According to Mc Alpine (personal communication), the species has an extensive distribution through Mexico and Central America.

331. Calephelis sp. 1

SPECIMENS: 6♂♂, 3♀♀; 9 mi. ENE Sontecomapan, 0 feet, 15 Aug. 1962, 1♂: 0.5 mi. S Barrosa, 500 feet, 30 June 1962, 1♂: 2 mi. NE Catemaco, 1,100 feet, 26 July 1962, 1♂; 27 July 1962, 1♀; 12 Aug. 1962, 1♂: 2 mi. WSW Tapalapan, 1,600 feet, 20 Sept. 1962, 1♂: 2 mi. SSW Peak Volcán San Martín Tuxtla, 2,200 feet, 24 Aug. 1962, 1♂.

This species is common in Recently Abandoned Milpas, Pastures, and along Hedgerows throughout the Sierra. The butterflies have a relatively rapid flight that usually does not exceed three feet of the ground. The species is being described in Mc Alpine's forth-

coming revision of the genus Calephelis. According to Mc Alpine (personal communication) the species is widely distributed in Mexico.

332. Calephelis sp. 2

SPECIMENS: 3♂♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 26 July 1962, 1♂; 16 Sept. 1962, 1♂, 1♀: 8 mi. SSE Catemaco, 1,950 feet, 29 Sept. 1962, 1♂.

This species apparently is sympatric with the former but less common. Most butterflies were collected in Recently Abandoned Milpas, Pastures, and along Hedgerows. The species is being described by Mc Alpine in his forthcoming revision of the genus Calephelis.and who states (personal communication) that the species is known from Tabasco, Quintana Roo, and Yucatán. Thus, my specimens from the Sierra represent a new state record.

333. Charis velutina (Godman & Salvin)

SPECIMENS: 6♂♂; 800-1,900 feet; 27 Feb.-24 Oct.

Charis velutina is uncommon and found primarily along the borders of Hedgerows, Semi-Evergreen-Seasonal Forest, Lower Montane Rain Forest and in the Deciduous Woodland and the Pinus-Quercus Associes. The flight is relatively rapid and close to the ground.

334. Charis myrtea (Godman & Salvin)

SPECIMENS: 9♂♂; 1,900 feet, 13 Nov.

This species is common but extremely local. All nine specimens were collected as they rested on the upper- and undersurfaces

of leaves of an unidentified tall bush that was growing along the margin of a disturbed section of Semi-Evergreen Seasonal Forest on Cerro Cintepec.

335. Charis psaros (Godman & Salvin)

SPECIMEN: 1♂; 1.5 mi. NNW Ocotal Chico, 2,700 feet, 15 June 1965.

Charis psaros is rare. The single specimen was collected along a sunlit trail within the Liquidambar-Quercus Associes of the Montane Rain Forest.

336. Charmona gynaea zama (Bates)

SPECIMENS: 6♂♂, 2♀♀; 1,100-2,400 feet; 21 June-16 Nov.

This metalmark is locally common, being found mainly along the margins of the Semi-Evergreen Seasonal Forest, the Pinus-Quercus Associes of the Deciduous Woodland, Montane Rain Forest, and Hedgerows.

337. Baeotis hisbon zonata Felder

SPECIMENS: 3♀♀; 1,800, 1,900 feet; 29 May-25 Oct.

All three specimens of this rare species were collected as they fed on the blossoms of Calliandra grandiflora in the Pinus-Quercus Associes of the Decidous Woodland.

338. Lymnas pixe pixe Boisduval

SPECIMENS: 4♂♂, 8♀♀; 500-1,800 feet; 20 June-10 Aug.

This riodinid is locally common and found principally along the margins of the Semi-Evergreen Seasonal Forest and Hedgerows. Most

butterflies were collected on cloudy days.

339. Mesene margaretta (White)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 26 Sept. 1962.

The single individual was collected as it fed on the white flowers of the composite Bidens pilosa var. bimucronata in a Recently Abandoned Milpa bordering Lago Catemaco.

340. Mesene croceela Bates

SPECIMENS: 7♂♂, 11♀♀; 1,100-2,300 feet; 22 Feb.-30 Oct.

This species is locally common and seasonal. Most specimens were collected in the fall within the Pinus-Quercus Associes of the Deciduous Woodland as they fed on the blossoms of Calliandra grandiflora and as they rested on the undersurfaces of the leaves of Quercus conspersa. The species probably is colonial for rarely was a single butterfly seen alone.

341. Symmachia rubina Bates

SPECIMENS: 2♀♀; Ocotal Chico, 1,900 feet, 9 July 1963, 1♀: 8 mi. SSE Catemaco, 1,900 feet, 13 Nov. 1962, 1♀.

This metalmark is rare. One female was collected as it fed on the blossoms of Heliotropium indicum-- a plant that is common around the houses of the Popoluca Indians-- and the other as it rested on the undersurface of a leaf in a Recently Abandoned Milpa.

342. Symmachia accusatrix Westwood

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 30 Aug. 1963.

The single specimen was collected as it rested on the undersurface of a leaf of an unidentified shrub along the margin of a section of Semi-Evergreen Seasonal Forest.

343. Symmachia tricolor hedemanni (Felder)

SPECIMENS: 3♂♂; 2,100, 2,700 feet; 5 May, 24 Oct.

This species is uncommon and restricted to the Pinus-Quercus Associes of the Deciduous Woodland. All butterflies were collected as they fed on the flowers of Calliandra grandiflora.

344. Phaenochitonia sagaris tyriotes (Godman & Salvin)

SPECIMENS: 2♂♂; 2 mi. SW Sontecomapan, 900 feet, 12 July 1962, 1♂: Ocotal Chico, 1,900 feet, 11 Feb. 1965, 1♂.

This riodinid is rare. One butterfly was collected as it flew through a Recently Abandoned Milpa and the other as it rested on the undersurface of a leaf in a shrubby area within the Pinus-Quercus Associes of the Deciduous Woodland.

345. Anteros carausius carausius Westwood

SPECIMENS: 5♂♂, 3♀♀; 1,100-2,600 feet; 12 March-23 Oct.

Although uncommon, this species is found in a variety of habitats-- margins of Hedgerows, the Semi-Evergreen Seasonal Forest, and the Lower Montane Rain Forest. Unlike most other species of riodinid, the butterflies of A. c. carausius very seldom hold their wings in a horizontal position.

346. Calydna venusta Godman & Salvin

SPECIMENS: 1♂, 1♀; 0.5 mi. S Barrosa, 500 feet, 30 June 1962, 1♀: 2 mi. NE Catemaco, 1,100 feet, 4 Oct. 1962, 1♂.

Both specimens of this rare species were collected along the margins of Semi-Evergreen Seasonal Forest. Calydna venusta has not been recorded from Veracruz. The nearest recorded locale is Oaxaca (Godman & Salvin, 1879-1901).

347. Emesis liodes Godman & Salvin

SPECIMENS: 6♂♂, 3♀♀; 1,100 feet; 28 June-7 Sept.

Emesis liodes is uncommon and extremely local. All nine specimens were collected as they rested on the undersurfaces of leaves along the margins of and just within a small section of Semi-Evergreen Seasonal Forest bordering Lago Catemaco. The flight is rapid and erratic.

348. Emesis mandana mandana (Cramer)

SPECIMENS: 1♂, 4♀♀; 500-2,600 feet; 12 March-23 Sept.

This riodinid is uncommon and found primarily along the margins of Hedgerows and the Semi-Evergreen Seasonal Forest. Most butterflies were collected as they fed on the blossoms of Cordia spinescens.

349. Emesis tenedia Felder

SPECIMENS: 1♂, 7♀♀; 1,100-2,450 feet; 14 June-18 Aug.

Although E. tenedia is uncommon, the species nevertheless is the most common member of the genus within the Sierra. The butter-

flies were collected in a variety of habitats-- along the margins of Hedgerows and the Semi-Evergreen Seasonal Forest, and in Recently Abandoned Milpas and grassy areas in the Pinus-Quercus Associes of the Deciduous Woodland. The behavior is similar to that of most members of the family.

350. Emesis lupina Godman & Salvin

SPECIMENS: 3♂♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 29 July 1962, 1♀; 28 Sept. 1962, 1♂; 30 Sept. 1962, 2♂♂.

All specimens of this uncommon species were collected along the margins of small patches of Semi-Evergreen Seasonal Forest bordering Lago Catemaco. Hoffmann (1940) records the species only from the valley of the Río Balsas (Guerrero). Therefore, my specimens from the Sierra represent a new state record.

351. Tharops menander isthmiae Godman & Salvin

SPECIMENS: 6♂♂, 1♀; 1,100 feet; 1 July-12 Aug.

This species is local and uncommon. All specimens were collected in a small pasture bordered by small patches of Semi-Evergreen Seasonal Forest. The butterflies are attracted to the blossoms of Lantana camara.

352. Thisbe irenea belides Stichel

SPECIMENS: 1♂, 1♀; 1 mi. SE Sontecomapan, 700 feet, 14 July 1962, 1♂: 2 mi. SW Sontecomapan, 900 feet, 24 July 1962, 1♀.

This riodinid is rare. Both specimens were collected along the borders of Lower Montane Rain Forest.

353. Polystichtis sudias (Hewitson)

SPECIMENS: 5♂♂, 7♀♀; Ocotal Grande, 1,800 feet, 15 May 1965, 2♂♂; 1,900 feet, 19 June 1963, 2♀♀: 1 mi. NNE Ocotal Chico, 2,000 feet, 31 May 1965, 1♂; 2,100 feet, 14 June 1963, 1♀: 2 mi. N Ocotal Chico, 2,800 feet, 3 Aug. 1963, 1♀; 2,900 feet, 26 July 1963, 1♀: 3 mi. NNW Ocotal Chico, 3,550 feet, 1♀: 2 mi. NNW Ocotal Chico, 3,800 feet, 13 April 1965, 2♂♂, 1♀.

This dimorphic species is locally common and found primarily in the Liquidambar-Quercus Associes of the Montane Rain Forest and the Montane Rain Forest on the Santa Marta massif. The butterflies were collected most frequently as they rested on the undersurfaces of leaves and on the trunks of gum trees. The flight of the male is very rapid, erratic, and usually above eight feet of the ground. The flight of the female usually is considerably slower and nearer the ground than that of the male. On several occassions I mistook females for specimens of Dismorphia fortunata (Pieridae:Dismorphiinae) and for one of the transparent species of ithomiids.

354. Anatole agave (Godman & Salvin)

SPECIMEN: 1♂; 2 mi. NE Catemaco, 1,100 feet, 18 Nov. 1962.

The single male was collected as it flew about one foot above the ground in a Pasture bordering Lago Catemaco. The flight of this species is not as rapid and erratic as most members of the family.

355. Anatole rossi Clench

SPECIMENS: 61♂♂, 32♀♀; 1.25 mi. E Mecayapan, 1,025 feet, 1 Aug. 1963, 1♂: 0.25 mi. SSE Ocotal Chico, 1,700 feet, 8 June 1963, 2♀♀: 0.5 mi. SSE Ocotal Chico, 1,800 feet, 23 June 1963, 1♂; 25 July 1963, 1♂; 26 July 1963, 1♂: 1 mi. S Ocotal Chico, 1,800 feet, 7 June 1963, 2♂♂: 0.25 mi. E Ocotal Grande, 1,800 feet, 19 June 1963, 1♀: 1 mi.

SSE Ocotal Chico, 1,800 feet, 23 Oct. 1962, 1♂: Ocotal Chico, 1,800 feet, 8 June 1963, 4♀♀; 4 Aug. 1963, 1♂; 1,900 feet, 7 June 1963, 2♂♂, 2♀♀; 13 July 1965, 26♂♂, 5♀♀: 1 mi. E Ocotal Grande, 1,850 feet, 8 Aug. 1963, 1♂: 0.25 mi. E Ocotal Chico, 1,900 feet, 9 June 1963, 3♂♂, 2♀♀: Ocotal Grande, 1,900 feet, 19 June 1963, 1♂; 4 July 1963, 1♂: 0.25 mi. SE Ocotal Chico, 1,950 feet, 1 Aug. 1963, 1♂: 0.25 mi. SE Ocozotepec, 1,950 feet, 1 Aug. 1963, 6♀♀: 0.25 mi. ESE Ocozotepec, 1,950 feet, 1 Aug. 1963, 3♂♂ (of which 1 is the holotype): Ocozotepec, 2,000 feet, 1 Aug. 1963, 3♂♂, 4♀♀: 0.25 mi. N Ocotal Chico, 2,100 feet, 11 June 1963, 3♂♂; 15 June 1963, 1♂; 18 June 1963, 1♀: 1.25 mi. N Ocotal Chico, 2,200 feet, 26 July 1963, 1♀: 1 mi. N Ocotal Grande, 2,300 feet, 15 May 1965, 5♂♂; 2 June 1965, 1♂: 1.25 mi. NE Ocotal Chico, 2,600 feet, 16 June 1963, 1♂; 2,700 feet, 16 June 1963, 1♀. (All specimens collected in 1962 and 1963, except the one holotype, are paratypes-- see Clench, 1964).

This metalmark, which is described in Clench (1964), is locally abundant throughout the Pinus-Quercus Associes of the Deciduous Woodland. The butterflies occur in small colonies only on many of the pine covered ridges in the immediate vicinities of the Popolucan villages of Ocotal Chico, Ocotal Grande, and Ocozotepec. The immature stages (of which most are myrmecophilous) and the life history of the species have been described (Ross, 1964c, 1966). The larval food plant is Croton repens.

356. Peplia lamis molpe (Hübner)

SPECIMENS: 11♂♂, 8♀♀; 150-2,400 feet; 15 May-18 Nov.

This species is common in most open, shrubby areas throughout the Sierra irrespective of plant formation. Most butterflies were collected as they visited flowers, particularly those of Vismia mexicana, and as they rested on the undersurfaces of leaves.

357. Nymula calice mycone (Hewitson)

SPECIMEN: 1♂; Ocotal Chico, 1,900 feet, 5 Feb. 1965.

The single male of this species was collected along the margin of a section of Semi-Evergreen Seasonal Forest on the Santa Marta massif.

358. Calociasma lilina (Butler)

SPECIMEN: 1♂; 0.5 mi. S Barrosa, 500 feet, 30 June 1962.

This riodinid is rare. The single specimen was collected as it rested on the undersurface of a leaf along the margin of a small section of Semi-Evergreen Seasonal Forest.

TRIBE Theopini

359. Theope eleutho Godman & Salvin n. ssp.

SPECIMENS: 2♂♂, 1♀; 2 mi. NE Catemaco, 1,100 feet, 3 Aug. 1962, 1♂; 7 Sept. 1962, 1♀: Ocotal Chico, 1,900 feet, 4 July 1963.

This species is uncommon and found both in pastures and the Pinus-Quercus Associes of the Deciduous Woodland. The specimens were collected as they fed on the blossoms of Cordia spinescens. Clench (personal communication) states that the specimens from the Sierra probably represent a new subspecies. The nearest recorded locale for T. eleutho is Panamá (Godman & Salvin, 1879-1901).

VI. CORRELATION AND SYNTHESIS

Biotic Relationships

LIFE ZONES

Merriam (1892) in his original life zone classification unfortunately dealt only superficially with areas south of the United States. His broad "Tropical Region" included the entire Sierra de Tuxtla. However, several other authors-- Goldman (1920, 1951), Dickey and van Rossen (1938), and Lowery and Dalquest (1951)-- working in various localities in Mexico and Central America, have found it necessary within their respective study areas to subdivide this "Tropical Region." The resulting divisions or zones, as with nearly all of the life zones in North America, originally were defined and delineated using plants, mammals, and birds as indicator species. Lately, however, several workers (see Garth and Tilden, 1963) have recognized that insects-- especially butterflies with their fixed larval food plants, their relatively high mobility potential, and their migratory habits-- may, with some justification, be ranked below plants but before mammals and birds in order of decreasing reliability as zonal indicators.

Andrle (1964) was the first to attempt a zonal analysis of the Sierra de Tuxtla. His avifaunal and mammalian faunal investigations indicated that no distinct life zone boundaries existed but that only vaguely defined zones (if indeed they could be

termed zones) were evident. He recognized two major zones: a Humid Tropical Zone (divisible into an Upper Subzone and a Lower Subzone) and an Arid Tropical Zone (nondivisible).

In order to determine if the 359 species of butterflies in the Sierra can be grouped according to Andrle's classification, to one of the others proposed for other areas of Mexico, or, indeed, to any pattern at all, I have compiled a list of butterfly species that are associated with each plant formation (Table II). The butterfly species are divided into two categories. First, are "indicator species"-- those species that are found exclusively within the formation regardless of relative abundance. For the most part these species are in the Lycaenidae and Riodinidae, the members of which are notoriously flighty and evasive. Thus, additional collecting probably will remove many of these from the list. Second, are "characteristic species"-- those species that are found commonly within the formation but not confined to it.

An analysis of the data in Table II indicates that all of the formations below 2,500 to 3,000 feet are rather similar regarding characteristic butterfly species. Likewise, those formations above approximately 3,000 feet are rather similar but quite distinct from those at lower elevations. Indeed, of the 39 species listed as occurring in the high altitude formations (Elfin Woodland, Montane Thicket, and Montane Rain Forest), only nine (23%) occur commonly in formations at lower elevations. Thus, a major division in butterfly fauna apparently does exist within the Sierra-- a division separating the lower formations from the

TABLE II

PLANT FORMATIONS AND ASSOCIATED BUTTERFLIES
IN THE SIERRA DE TUXTLA

(When only one or two specimens were collected, these numbers appear in parentheses.)

1. Elfin Woodland

INDICATOR SPECIES

Pedaliodes pisonia circumducta
Dione moneta poeyii
Hypanartia dione
Celastrina argiolus gozora
Callophrys nr. longula (1)
Callophrys a. agricolor (1)
Thecla laothoe (1)

CHARACTERISTIC SPECIES

Graphium c. calliste
Papilio androgeus epidaurus
Dismorphia euryope
Dismorphia nemesis
Dismorphia jethys
Greta anetta
Dioriste tauropolis
Morpho thesæus justiciae
Morpho polyphemus luna
Heliconius hortense
Vanessa virginiensis
Limenitis leuceria
Anaea proserpina
Eumaeus debora
Euselasia cheles aurantiaca

2. Montane Thicket

INDICATOR SPECIES

Oleria zea
Epiphile plutonia
Prepona brooksiana (1)

CHARACTERISTIC SPECIES

Graphium c. calliste
Ithomia leila
Greta anetta
Dioriste tauropolis
Morpho thesæus justiciae
Morpho polyphemus luna
Heliconius hortense
Limenitis leuceria
Anaea proserpina
Eumaeus debora
Euselasia cheles aurantiaca

TABLE II (continued)

3. Montane Rain Forest

INDICATOR SPECIES

Thecla politus (1)

Thecla dodava (1)

CHARACTERISTIC SPECIES:

Parides photinus
Ithomia leila
Oleria paula
Dircenna klugi
Episcada artena
Greta anetta
Taygetes andromeda
Caligo uranus
Morpho theseus justiciae
Morpho polyphemus luna
Heliconius sapho leuce
Heliconius hortense
Limenitis leuceria
Eumaeus debora
Thecla plusios
Mesosemia gaudiolus
Polystichtis sudias

4. Liquidambar-Quercus Associes of the Montane Rain Forest (Ecotone)

INDICATOR SPECIES

Calycopis pisis (2)
Thecla thales (2)
Thecla tarpa (2)
Peropthalma tullius lasius (1)
Charis psaros (1)

CHARACTERISTIC SPECIES

Dismorphia fortunata
Eurema albula
Eurema dina westwoodi
Ithomia leila
Oleria paula
Dircenna klugi
Episcada artena
Pteronymia cottyto
Taygetes andromeda
Euptychia hesione
Euptychia themis
Euptychia disaffecta
Euptychia hermes sosybius
Caligo memnon
Morpho peleides montezuma
Heliconius cleobaea zorcaon
Heliconius ismenius telchinia
Heliconius sapho leuce
Heliconius petiveranus
Heliconius charitonius vazquezae
Calycopis beon
Strymon yojoa
Euselasia hieronymi
Polystichtis sudias
Peplia lamis molpe

5. Lower Montane Rain Forest

INDICATOR SPECIES

Hyposcada v. virginiana

Eryphanis aesacus (2)

TABLE II (continued)

INDICATOR SPECIES of the Lower Montane Rain Forest (continued)

Heliconius sara veraepacis (1)
Phyciodes clara (1)
Polygonia g-argenteum (2)
Catagramma lyca
Catagramma casta (1)
Limenitis oberthuri (2)
Thecla minthe
Thecla tera (1)
Thecla coronata (1)
Euselasia cataleuca
Thisbe irenea belides (2)

CHARACTERISTIC SPECIES

Parides photinus
Parides iphidamas
Parides arcas mylotes
Dismorphia fortunata
Dismorphia praxinoe
Itaballia pisonis kicaha
Itaballia v. viardi
Melinaea lilis imitata
Mechanitis polymnia lycidice
Mechanitis egaensis doryssus
Mechanitis menapis saturata
Hypothyris lycaste dionaea
Napeogenes tolosa
Ithomia patilla
Oleria paula
Aeria pacifica
Dircenna klugi
Episcada artena
Pteronymia cottyto
Greta oto
Greta nero
Pierella luna heracles
Taygetes andromeda
Taygetes keneza
Euptychia hesione
Euptychia metaleuca
Euptychia themis
Euptychia labe
Euptychia undina
Euptychia hermes sosybius
Euptychia libye
Caligo memnon
Caligo uranus
Morpho peleides montezuma
Heliconius cleobaea zorcaon
Heliconius ismenius telchinia
Heliconius doris transiens
Heliconius sapho leuce
Heliconius petiveranus
Heliconius charitonius vazquezae
Phyciodes phillyra
Biblis hyperia aganisa
Pyrrhogyra otolais neis
Diaethria anna
Dynamine mylitta
Dynamine dyonis
Hamadryas februa gudula
Hamadryas g. guatemalena
Limenitis iphicla
Limenitis paraeca
Anaea electra
Calycopis beon
Strymon yojoa
Thecla marysas damo

6. Semi-Evergreen Seasonal Forest

INDICATOR SPECIES

Epiphile adrasta bandusia
Nessaea aglaura
Myscelia rogenhoferi (1)
Chlorippe cherubina (1)
Anaea artacaena (1)
Euptychia nr. alcinoe
Calycopis trebula
Strymon albata (2)
Thecla inachus carpophora (2)
Thecla lisus (2)
Thecla jebus (1)

TABLE II (continued)

INDICATOR SPECIES of the Semi-Evergreen Seasonal Forest (continued)

Thecla mulucha (1)
Euselasia sergia (2)
Euselasia pusilla (2)
Euselasia eubule (1)
Hades noctula
Notheme eumeus diadema (1)
Charis myrtea
Symmachia accusatrix (1)
Calydna venusta (2)
Emesis liodes
Emesis lupina
Nymula calice mycone (1)
Calociasma lilina (1)

CHARACTERISTIC SPECIES

Graphium belesis
Parides p. polyzelus
Dismorphia fortunata
Eurema albula
Eurema dina westwoodi
Melinaea lilis imitata
Mechanitis polymnia lycidice
Mechanitis egaensis doryssus
Mechanitis menapis saturata
Hypothyris lycaste dionaea
Ithomia patilla
Oleria paula
Dircenna klugi
Episcada artena
Pteronymia cottyto
Greta nero
Greta oto
Pierella luna heracles
Taygetes andromeda
Taygetes keneza
Euptychia hesione
Euptychia mollina
Euptychia labe
Euptychia themis
Euptychia undina
Euptychia hermes sosybius
Euptychia libye
Caligo memnon
Morpho peleides montezuma
Heliconius cleobaea zorcaon
Heliconius ismenius telchinia
Heliconius doris transiens
Heliconius petiveranus
Heliconius charitonius vazquezae
Chlosyne janais
Biblis hyperia aganisa
Pyrrhogyra otolais neis
Diaethria anna
Dynamine mylitta
Dynamine dyonis
Hamadryas februa gudula
Hamadryas ferronia farinulenta
Hamadryas g. guatemalena
Limenitis iphicle
Limenitis paraeca
Anaea aidea
Anaea electra
Calycopis beon
Strymon yojoa
Heterosmaitia palegon
Thecla marsyas damo
Mesosemia tetrica
Lymnas p. pixe

7. Bursera-Sabal-Orbignya Associes of the Semi-Evergreen Seasonal Forest

INDICATOR SPECIES

Itaballia demophile calydonia
Calycopis sp. "C"

TABLE II (continued)

Bursera-Sabal-Orbignya Associes of the Semi-Evergreen Seasonal Forest (continued)

CHARACTERISTIC SPECIES

The same as those for the Semi-Evergreen Seasonal Forest.

8. Savanna

INDICATOR SPECIES

None.

CHARACTERISTIC SPECIES

Papilio thoas autocles
Phoebis sennae marcellina
Phoebis agarithe maxima
Eurema lisa
Eurema nise nelphe
Euptychia gemma freemani
Euptychia mollina
Euptychia hermes sosybius
Actinote guatemalena veraecruzis
Thessalia t. theona
Junonia evarete
Mestra amymone
Hamadryas februa gudula
Hamadryas g. guatemalena
Marpesia chiron
Limenitis iphicla
Limenitis paraeca
Libytheana carinenta mexicana
Calycopis beon
Strymon yojoa
Thecla brescia
Hemiargus ceraunus zachaeina
Hemiargus huntingtoni hannoides
Everes comyntas
Leptotes cassius striata
Peplia lamis molpe

9. Deciduous Woodland

INDICATOR SPECIES

Eunica alcmena
Strymon serapio
Thecla maeonis (1)

CHARACTERISTIC SPECIES

All of those in the Savanna in addition to Mesene croceela.

10. Pinus-Quercus Associes of the Deciduous Woodland

INDICATOR SPECIES

Chlosyne definita (1)
Strymon melinus

TABLE II (continued)

INDICATOR SPECIES of the Pinus-Quercus Associes of the Deciduous Woodland (continued)

Callophrys leucania (1)
Thecla augustula (1)
Thecla gabatha (1)
Thecla clarina
Thecla denarius
Hemiargus i. isola (1)
Baeotes hisbon zonata
Symmachia tricolor hedemanni
Isapis agyrtus hera (1)
Anatole rossi

CHARACTERISTIC SPECIES

Papilio thoas autocles
Phoebis agarithe maxima
Phoebis philea
Phoebis sennae marcellina
Eurema d. daira
Eurema mexicana
Eurema lisa
Eurema nise nelphe
Euptychia gemma freemani
Euptychia mollina
Euptychia gigas
Actinote guatemalena veraecruzis
Thessalia t. theona
Junonia evarete
Euptoieta hegesia hoffmanni
Mestra amymone
Hamadryas februa gudula
Hamdaryas feronia farinulenta
Hamadryas g. guatemalena
Limenitis iphicla
Libytheana carinenta mexicana
Eumaeus minyas
Calycopis beon
Electrostrymon cyphara
Strymon yojoa
Thecla brescia
Hemiargus ceraunus zachaeina
Hemiargus huntingtoni hannoides
Everes c. comyntas
Leptotes cassius striata
Mesene croceela
Peplia lamis molpe

11. Littoral Woodland

INDICATOR SPECIES

Anaea morvus boisduvali

CHARACTERISTIC SPECIES

Papilio thoas autocles
Parides p. polyzelus
Colias cesonia
Phoebis sennae marcellina
Phoebis argante
Phoebis agarithe maxima
Eurema albula
Eurema mexicana
Eurema lisa
Eurema nise nelphe
Eurema proterpia
Eurema nicippe
Eurema dina westwoodi
Ascia m. monuste
Anteos clorinde
Anteos maerula
Euptychia hesione
Euptychia hermes sosybius
Caligo memnon
Melinaea lilis imitata
Mechanitis polymnia lycidice
Mechanitis egaensis doryssus
Morpho peleides montezuma
Agraulis vanillae incarnata
Dryas julia moderata
Heliconius cleobaea zorcaon

TABLE II (continued)

CHARACTERISTIC SPECIES of the Littoral Woodland (continued)

Heliconius ismenius telchinia
Heliconius charitonius vazquezae
Heliconius petiveranus
Anartia jatrophae luteipicta
Anartia fatima venusta
Biblis hyperia aganisa
Hamadryas februa gudula
Hamadryas ferronia farinulenta
Marpesia chiron
Limenitis iphicla
Limenitis paraeca
Eumaeus minyas
Calycopis beon
Hemiargus ceraunus zachaeina
Everes c. comyntas
Peplia lamis molpe

12. Swamp Forest

INDICATOR SPECIES

Thecla antincus (1)

Eurybia lycisca (2)

CHARACTERISTIC SPECIES

Dismorphia fortunata
Eurema albula
Eurema dina westwoodi
Tithorea harmonia salvadoris
Melinaea lilis imitata
Mechanitis polymnia lycidice
Mechanitis egaensis doryssus
Mechanitis menapis saturata
Hypothyris lycaste dionaea
Ithomia patilla
Oleria paula
Dircenna klugi
Pteronymia cottyto
Greta oto
Greta nero
Taygetes andromeda
Euptychia hesione
Euptychia metaleuca
Euptychia themis
Euptychia hermes sosybius
Euptychia libye
Caligo memnon
Morpho peleides montezuma
Heliconius cleobaea zoreaon
Heliconius ismenius telchinia
Heliconius petiveranus
Heliconius charitonius vazquezae
Pyrrhogyra hypensor
Pyrrhogyra otolais neis
Hamadryas februa gudula
Hamadryas feronia farinulenta
Hamadryas g. guatemalena
Calycopis beon
Thecla marysas damo

13. Mangrove Woodland

INDICATOR SPECIES

None.

CHARACTERISTIC SPECIES

The same as those for the Swamp Forest.

TABLE II (continued)

14. Recently Abandoned Milpas

INDICATOR SPECIES

Tmolus echion echiolus (1)
Thecla ares (1)
Mesene margaretta

CHARACTERISTIC SPECIES

Papilio thoas autocles
Appias drusilla poeyi
Ascia m. monuste
Colias cesonia
Phoebis sennae marcellina
Phoebis philea
Phoebis argante
Phoebis agarithe maxima
Eurema d. daira
Eurema boisduvaliana
Eurema mexicana
Eurema proterpia
Eurema nicippe
Eurema lisa
Eurema nise nelphe
Danaus gilippus strigosus
Dryas julia moderata
Euptoieta hegesia hoffmanni
Chlosyne janais
Chlosyne l. lacinia
Thessalia t. theona
Phyciodes vesta
Phyciodes claudina guatemalena
Phyciodes a. ardys
Phyciodes myia
Phyciodes griseobasolis
Anartia jatrophae luteipicta
Anartia fatima venusta
Dynamine mylitta
Hamadryas februa gudula
Hamadryas g. guatemalena
Marpesia chiron
Limenitis paraeca
Anaea aidea
Calycopis beon
Strymon yojoa
Thecla marsyas damo
Hemiargus ceraunus zachaeina
Hemiargus huntingtoni hannoides
Everes c. comyntas
Leptotes cassius striata
Peplia lamis molpe

15. Pastures

INDICATOR SPECIES

Opsiphanes boisduvalii (1)
Opsiphanes cassiae castaneus
Phyciodes eranites mejicana (1)
Hamadryas iphthime (1)
Limenitis erotia (1)
Chloripppe pavon
Prepona laertes pallantias (2)
Anaea marthesia (2)
Callophrys goodsoni (1)
Atlides polybe
Evenus regalis (1)
Thecla cypria
Thecla janais (2)
Thecla vibidia (1)
Thecla hecate (2)
Thecla ligurina (1)
Thecla scopas
Ancylusis jurgensenii (1)
Anatole agave (1)
Theope eleutho

TABLE II (continued)

Pastures (continued)

CHARACTERISTIC SPECIES

Papilio thoas autocles
Appias drusilla poeyi
Ascia m. monuste
Colias cesonia
Phoebis sennae marcellina
Phoebis philea
Phoebis argante
Phoebis agarithe maxima
Eurema boisduvaliana
Eurema mexicana
Eurema proterpia
Eurema lisa
Eurema nise nelphe
Eurema dina westwoodi
Eurema nicippe
Danaus gilippus strigosus
Euptychia hermes
Dryas julia moderata
Euptoieta hegesia hoffmanni
Chlosyne janais
Chlosyne l. lacinia
Thessalia t. theona
Phyciodes vesta
Phyciodes frisia tulcis
Phyciodes claudina guatemalena
Phyciodes a. ardys
Phyciodes myia
Phyciodes griseobasolis
Anartia jatrophae luteipicta
Anartia fatima venusta
Dynamine mylitta
Hamadryas februa gudula
Hamadryas g. guatemalena
Marpesia chiron
Limenitis paraeca
Anaea aidea
Calycopis beon
Strymon yojoa
Heterosmaitia palegon
Thecla marsyas damo
Thecla meton
Thecla tephraeus
Hemiargus ceraunus zachaeina
Hemiargus huntingtoni hannoides
Everes c. comyntas
Leptotes cassius striata
Peplia lamis molpe

16. Hedgerows

INDICATOR SPECIES

Callophrys miserabilis (2)
Panthiades ochus (1)
Thecla neora (1)
Thecla barajo (2)
Thecla hassan (1)
Thecla hesperitis (1)
Thecla demonassa (2)
Thecla ambrax (1)

CHARACTERISTIC SPECIES

Graphium e. epidaus
Papilio thoas autocles
Parides p. polyzelus
Eurema albula
Eurema dina westwoodi
Oleria paula
Pteronymia cottyto
Euptychia hesione
Euptychia themis
Euptychia hermes sosybius
Euptychia libye
Anartia jatrophae luteipicta
Anartia fatima venusta
Metamorpha stelenes biplagiata
Biblis hyperia aganisa
Dynamine mylitta
Hamadryas februa gudula
Hamadryas g. guatemalena

TABLE II (continued)

CHARACTERISTIC SPECIES of Hedgerows (continued)

Marpesia chiron
Limenitis iphicla
Limenitis paraeca
Anaea aidea
Caligo memnon
Morpho peleides montezuma
Dryas julia moderata
Heliconius cleobaea zorcaon
Heliconius ismenius telchinia
Heliconius petiveranus
Heliconius charitonius vazquezae
Phyciodes claudina guatemalena
Phyciodes phillyra
Calycopis beon
Strymon yojoa
Heterosmaitia palegon
Thecla marysas damo
Thecla meton
Thecla meton
Thecla tephraeus
Charis velutina
Lymnas p. pixe
Peplia lamis molpe

upper ones (the Liquidambar-Quercus Associes of the Montane Rain Forest serving as a transitional zone or ecotone).

In addition, the data indicate that a second division-- less pronounced than the first but nonetheless significant-- can be made. A comparison of the formations at relatively low altitudes indicates that the greatest diversity occurs between the species in the Lower Montane Rain Forest and the remaining formations. Indeed, 24 species (13 indicator, 11 characteristic) occur commonly only within the Lower Montane Rain Forest. This "uniqueness" is approached by only one other formation, the Semi-Evergreen Seasonal Forest, which has 25 species (23 indicator, two characteristic) found commonly only within its borders. Thus, a line separating the Lower Montane Rain Forest from all other formations at relatively low elevations can be drawn.

In conclusion, my analysis of the butterfly fauna has led me to the opinion that the classification system employed by Andrle (1964) does not reflect accurately the existing relationships (at least for butterflies) but that the system originally expressed by Goldman (1951) is more applicable. Following the system employed by the latter, I divide the Sierra into two major zones: first, a Lower Tropical Zone, subdivisible into a Humid Lower Tropical Subzone (corresponding to the Humid Tropical Upper Subzone of Andrle), and an Arid Lower Tropical Subzone (corresponding to the Arid Tropical Zone of Andrle); and second, an Upper Tropical Zone, nondivisible and corresponding to the Humid Tropical Upper Subzone of Andrle. These zones and subzones are defined and characterized

in Table III.

BIOTIC PROVINCE

The concept of the Biotic Province, originated by Vestal (1914) and developed by Dice (1943), by definition dictates that the entire Sierra de Tuxtla fall within only one category. This, according to Goldman (1951) and Goldman and Moore (1945) is the Veracruz Biotic Province, which "embraces the tropical lowlands from eastern San Luis Potosí, southern Tamaulipas, and northeastern Puebla, southwesterly through Veracruz and Tabasco and small portions of northern Oaxaca and Chiapas." However, I question the validity of including the Sierra within the "tropical lowlands" of Veracruz since the majority of the land surfaces within the range have an average elevation in excess of 1,000 feet and four volcanoes have maximum elevations in excess of 3,000 feet. Furthermore, most of the flora and fauna found at elevations in excess of 2,500 to 3,000 feet seem to have their affinities with forms common further south. I conclude, therefore, that a new biotic province should be erected for the Sierra de Tuxtla.

TABLE III

LIFE ZONES AND CORRESPONDING PLANT FORMATIONS IN THE SIERRA DE TUXTLA

I. Lower Tropical Zone.-- This zone is located from sea level to approximately 2,500 to 3,000 feet in altitude and probably receives an average annual rainfall of less than 150 inches. The zone is divisible into two subzones.

A. Humid Lower Tropical Subzone.-- This subzone is found principally on the Gulf slopes of the major volcanoes below 2,500 to 3,000 feet where the average annual rainfall probably averages between 150 and 110 inches. Only one plant formation-- Lower Montane Rain Forest-- is included in this subzone.

B. Arid Lower Tropical Subzone.-- This subzone is found principally along the coast and on the leeward slopes of the major volcanoes below 2,500 to 3,000 feet, areas in which the average annual rainfall probably is less than 110 to 100 inches. This subzone includes the following plant formations:

Littoral Woodland
Mangrove Woodland
Swamp Forest
Savanna
Deciduous Woodland and the Pinus-Quercus Associes
Semi-Evergreen Seasonal Forest and the Bursera-Sabal-Orbignya Associes

II. Upper Tropical Zone.-- This zone is located from approximately 2,500 to 3,000 feet in altitude to the peaks of the principal volcanoes (3,750 feet, 5,250 feet, and 5,450 feet for Volcáns San Martín Pajapan, Santa Marta, and San Martín Tuxtla, respectively) where the average annual rainfall probably is in excess of 150 inches. This zone includes the following plant formations:

Montane Rain Forest (the Liquidambar-Quercus Associes being an ecotone)
Montane Thicket
Elfin Woodland

Because the "Miscellaneous Formations" (Recently Abandoned Milpas, Pastures, and Hedgerows) occur throughout the Sierra where man has settled, I have not assigned these to any life zone.

Faunal-Floral Relationships

AREAL DISTRIBUTION

A total of 359 species of butterflies representing 133 genera and eight families now have been recorded from the Sierra de Tuxtla. Of these species, 258 (72%) are found primarily in open and relatively open plant formations throughout the range, and for the most part were collected in fields, pastures, and along hedgerows and the margins of forests. In general, members of the Lycaenidae and Riodinidae visit the blossoms of Cordia spinescens and Calliandra grandiflora very frequently; members of the genera Hamadryas, Historis, Smyrna, Gynaecia, Prepona, and Anaea (Nymphalidae) are attracted to fermenting sap oozing from the trunks of citrus trees and to fermenting juices of fallen fruit (principally mangoes); members of the genera Papilio, Graphium (Papilionidae), Colias, Anteos, Phoebis, Eurema (Pieridae), Chlosyne, Phyciodes, Diaethria, Dynamine, Marpesia (Nymphalidae), Hemiargus, Leptotes, and Everes (Lycaenidae) visit flowers (and damp earth) indiscriminately.

The interiors of forests with closed canopies are inhabited by a minority of butterfly species (101 species, 28% of total species). These species belong to 53 genera, 13 subfamilies and eight families and are listed in Table IV. From this table, certain correlations can be made. First, approximately 41% of the butterfly species inhabiting the forests of the Sierra de Tuxtla belong to the families Ithomiidae and Satyridae. Second, all members of the family Ithomiidae and the subfamily Lycoreinae (Danaidae) occur

TABLE IV

GENERA OF BUTTERFLIES COLLECTED IN THE SIERRA DE TUXTLA WITHIN FORESTS WITH CLOSED CANOPIES

(Numbers behind genera indicate number of species involved; numbers behind subfamilies indicate total number of species collected.)

A. Genera in which all species occur within forests

Catasticta (1)	Pieridae:Pierinae	(9)
Archonias (1)	"	"
Itaballia (3)	"	"
Tithorea (1)	Ithomiidae:Ithomiinae	(20)
Melinaea (1)	"	"
Mechanitis (3)	"	"
Hypothyris (1)	"	"
Napeogenes (1)	"	"
Ithomia (2)	"	"
Hyposcada (1)	"	"
Oleria (2)	"	"
Aeria (1)	"	"
Dircenna (1)	"	"
Episcada (1)	"	"
Pteronymia (1)	"	"
Greta (3)	"	"
Hypoleria (1)	"	"
Lycorea (1)	Danaidae:Lycoreinae	(1)
Pierella (1)	Satyridae:Satyrinae	(23)
Pedaliodes (1)	"	"
Dioriste (1)	"	"
Eryphanis (1)	Satyridae:Brassolinae	(5)
Caligo (2)	"	"
Polygonia (1)	Nymphalidae:Nymphalinae	(90)
Myscelia (2)	"	"
Eumaeus (2)	Lycaenidae:Lycaeninae	(88)
Theorema (1)	"	"
Oenomaeus (1)	"	"
Perophthalma (1)	Riodinidae:Riodininae	(42)
Leucochimona (2)	"	"
Mesosemia (2)	"	"

TABLE IV (continued)

Eurybia (1) Riodinidae:Riodininae (continued)
Thisbe (1) " "
Polystichtis (1) " "

B. Genera in which half or more species occur within forests

Parides (5) Papilionidae:Papilioninae (21)

Dismorphia (4) Pieridae:Dismorphiinae (6)

Taygetes (4) Satyridae:Satyrinae (23)
Euptychia (12) " "

Morpho (2) Nymphalidae:Amathusiinae (3)

Epiphile (1) Nymphalidae:Nymphalinae (90)
Catonephele (1) " "

Calycopis (2) Lycaenidae:Lycaeninae (88)

Euselasia (4) Riodinidae:Euselasiinae (6)

C. Genera in which less than half the species occur within forests

Graphium (2) Papilionidae:Papilioninae (21)

Eurema (3) Pieridae:Coliadinae (22)

Heliconius (1) Nymphalidae:Heliconiinae (17)

Chlosyne (1) Nymphalidae:Nymphalinae (90)
Phyciodes (1) " "
Limenitis (1) " "
Prepona (2) " "
Anaea (3) " "

Thecla (4) Lycaenidae:Lycaeninae (88)

Emesis (1) Riodinidae:Riodininae (42)

within forests. Third, more than half the members of the Pierinae (five species, 55%) and Dismorphiinae (four species, 66%) (Pieridae), Satyrinae (19 species, 83%) and Brassolinae (three species, 60%) (Satyridae), and Amathusiinae (two species, 66%) (Nymphalidae) are found within forests. Fourth, relatively few species in the Lycaenidae (10 species, 11%) and the Riodinidae (13 species, 27%) occur within forests.

Although the species in the previously mentioned families and subfamilies share a common habitat type (tropical forest), they nonetheless have different preferred micro-habitats. The ithomiids usually are found in dank ravines in nonspecific butterfly assemblages and in the vicinities of four flowering plants: Tournefortia glabra, Eupatorium macrophyllum, E. pittieri, and Psychotria padifolia. The satyrids are more randomly distributed throughout the forests, Taygetes spp., Dioriste tauropolis, Pediliodes pisonia circumducta, Eryphanis aesacus, and Caligo spp. preferring montane formations and Euptychia spp. preferring less dense forest formations. The single species of Lycorea (Danaidae: Danainae) is found in relatively open areas within the Semi-Evergreen Seasonal Forest and the Lower Montane Rain Forest and usually in small butterfly assemblages. The five species (three genera) of Pierinae are found in the Lower Montane Rain Forest and the Semi-Evergreen Seasonal Forest and usually within nonspecific butterfly assemblages-- Catisticta ni nimbice preferring less dense areas and Archonias tereas and Itaballia spp. preferring more dense and shaded locales. The four species of Dismorphia

(Dismorphiinae:Pieridae) prefer the montane formations-- D. praxinoe and D. fortunata the Lower Montane Rain Forest and D. euryope and D. nemesis the Elfin Woodland and Montane Thicket. The two species of Morpho (Amathusiinae:Nymphalidae) have very dissimilar ecologies-- M. polyphemus luna prefers the montane formations above 3,000 feet and M. peleides montezuma prefers the Lower Montane Rain Forest and other forests at relatively low elevations. The ten species (five genera) of lycaenids and 13 species (eight genera) of riodinids are found in a variety of forests; all seem to prefer the relatively bright sections.

ALTITUDINAL DISTRIBUTION

The maximum altitude of the Sierra is relatively low (5,450 feet) and thus vertical temperature change is not great. It is reasonable to assume that the entire Sierra falls within the normal altitudinal range of most butterfly species. (Indeed, species that are common in sunny fields along the coast and at relatively low altitudes frequently were seen sailing over the peaks of the highest volcanoes on sunny days.) Yet, as stated previously, the greatest diversity in the butterfly fauna occurs between the Upper and Lower Tropical Zones and so the obvious conclusion is that plant formations with their characteristic plants, some of which probably serve as larval and adult food plants, seem to be the principal factor governing butterfly distributions. In general, the majority of the butterfly species (320 species, 89%)

in the Sierra are primarily residents of the plant formations below 2,500 to 3,000 feet (the Lower Tropical Zone); only 39 species (11%) are commonly found in the forests above approximately 3,000 feet in elevation (the Upper Tropical Zone).

Climatic Relationships

SEASONAL VARIATION IN BUTTERFLY POPULATION DENSITIES

Although the climate of the Sierra de Tuxtla is relatively mild and uniform, enought diversity exists to produce a noticeable seasonal fluctuation in butterfly populations. In general, populations reach maximum densities in August, September, and October and minimum densities in January, February, March, and April. In fact, many species virtually disappear during the winter and spring months, even at relatively low elevations. Although many species of butterflies are known to migrate to other areas during the winter months (Williams, 1930, 1958), relatively few of these species (17 species, approximately 5%) occur in the Sierra. These are: Graphium philolaus (Papilionidae), Eurema nicippe, E. albula, E. lisa, Phoebis statira, P. trite, P. philae, P. argante, P. sennae, Anteos maerula, Ascia monuste (Pieridae), Agraulis vanillae, Vanessa virginiensis, Junonia evarete, Marpesia chiron (Nymphalidae), Danaus plexippus, and D. gilippus (Danaidae). The majority (59%) of these belong to the family Pieridae.

During my residence in the Sierra, I saw butterfly movements (which possibly could be termed migrations) in July and August involving principally Phoebis spp. and Marpesia chiron. Each day hundreds of individuals were observed as they flew usually between ten and 30 feet above the ground and in a northeasterly direction toward the Gulf. In addition, during the fall months populations

of Danaus plexippus and Vanessa virginiensis increased, possibly because of an influx of migrants from the north. Therefore, because of the relatively few migrant species (approximately 5%), and because of a population increase during the fall of at least two species (Danaus plexippus and Vanessa virginiensis), I conclude that migrations are an insignificant factor in the reduction of the winter butterfly populations in the Sierra de Tuxtla.

An alternative and more plausible explanation is that many species undergo an egg, a larval, or pupal diapause during the winter period, possibly as a result of decreased amounts of daylight, reduced temperatures, and reduced rainfall, or, any combination of these. Unfortunately, there is little data to support this hypothesis for I observed diapause (larval) only in one species--- Anatole rossi (Riodinidae; Ross, 1966)

Although spring-dry season population minima are the general rule, a few exceptions do exist. The seven species of Graphium (Papilionidae:Papilioninae), Dismorphia jethys (Pieridae:Dismorphiinae), and Actinote guatemalena veraecruzis (Nymphalidae:Acraeinae) have maximum population densities in spring and early summer. All of these species disappear subsequent to the commencement of the summer rains. Also, Morpho theseus justiciae (Nymphalidae: Amathusiinae) and Actinote leucomelas (Nymphalidae:Acraeinae) are common in March and April but then disappear completely only to reappear in September, October, and November. Thus, these last two species seem either to be double brooded and to have relatively lengthy immature stages or to undergo diapause during some stage in

their life cycles.

DAILY VARIATIONS IN BUTTERFLY POPULATION DENSITIES

During any given season, daily cycles in population densities are evident. Generally, most butterfly species are strongly photopositive and reach maximum activity levels between 10:00 A.M. and noon. However, during the periodic cool spells during the winter and on days of heavy cloud cover, maximum activity periods are delayed from one to two hours.

The notable exceptions to the previous generalization are the two species of Caligo (Satyridae:Brassolinae), Eurybia lycisca (Riodinidae:Riodininae), and all members of the Ithomiidae. The caligos are decidedly crepuscular and frequently wander out of the forest habitats and into more open areas at dusk; the two specimens of Eurybia lycisca were collected as they flew about in a very dark, dense thicket at 6:30 P.M.; and members of the Ithomiidae are active under practically all weather conditions (including fog and light rain) in addition to practically all hours of daylight (dawn to dusk).

Faunal Relationships

AFFINITIES AND ORIGINS

Although the Sierra has been open to animal and plant movements from the north and the range is sufficiently near the northern limits of the Neotropical region to permit an influx of Nearctic forms, the fauna and flora have remained essentially tropical. In his avifaunal investigations, Andrle (1964) states that 43% of the avian species recorded in the Sierra have southern origins as compared to 26% with more northern affinities (the remaining percentage represents species with unknown or uncertain origins). Unfortunately, the science of butterfly zoogeography has not advanced to the state whereby the origins and affinities of most genera and species groups can be defined (see Hovanitz, 1958). However, several generalizations, correlations, and speculations can be made about the Sierra's butterflies.

First, of the 359 species representing 133 genera, only 77 species (21%) representing 45 genera (34%) ever have been recorded from within the borders of the United States (references: dos Passos, 1964; Ehrlich and Ehrlich, 1961). These species, which are listed in Table V, for the most part are found in open, sunny areas throughout the Sierra. Furthermore, of these 77 species, 47 (61%) are known to be breeding residents (reference: Klots, 1951); the remaining species, 30 (39%), enter the United States only as occasional strays. Thus, the majority of the species of butterflies in the Sierra (79%) do not occur even as strays just 500 miles to

TABLE V

SPECIES OF BUTTERFLIES COLLECTED IN THE SIERRA DE TUXTLA KNOWN TO OCCUR WITHIN THE BORDERS OF THE UNITED STATES

Papilionidae (5 species, 25% of represented species)

Battus polydamas
Parides arcas mylotes
Papilio polyxenes asterius
Papilio thoas autocles
Papilio anchisiades idaeus

Pieridae (20 species, 54% of represented species)

Appias drusilla poeyi
Ascia m. monuste
Colias cesonia
Anteos clorinde
Anteos maerula
Phoebis sennae marcellina
Phoebis philea
Phoebis argante
Phoebis agarithe maxima
Phoebis statira jada
Eurema d. daira
Eurema boisduvaliana
Eurema mexicana
Eurema salome
Eurema proterpia
Eurema lisa
Eurema nise nelphe
Eurema dina westwoodi
Eurema nicippe
Nathalis iole

Danaidae (4 species, 100% of represented species)

Danaus p. plexippus
Danaus gilippus strigosus
Danaus eresimus montezuma
Lycorea ceres atergatis

Satyridae (2 species, 8% of represented species)

Euptychia gemma freemani
Euptychia hermes sosybius

Nymphalidae (31 species, 29% of represented species)

Dryadula phaetusa
Agraulis vanillae incarnata
Dryas julia moderata
Heliconius petiveranus
Heliconius charitonius vazquezae
Euptoieta hegesia hoffmanni
Chlosyne janais
Chlosyne l. lacinia
Chlosyne definita
Thessalia t. theona
Phyciodes vesta
Phyciodes frisia tulcis
Vanessa virginiensis
Junonia evarete

TABLE V (continued)

Nymphalidae (continued)

Anartia jatrophae luteipicta
Anartia fatima venusta
Metamorpha stelenes biplagiata
Hypanartia lethe
Biblis hyperia aganisa
Mestra amymone
Eunica monima
Dynamine dyonis
Hamadryas februa gudula
Hamadryas feronia farinulenta
Marpesia chiron
Marpesia petreus
Chlorippe pavon
Historis odius
Anaea aidea
Anaea pithyusa
Libytheana carinenta mexicana

Lycaenidae (16 species, 21% of represented species)

Eumaeus minyas
Chlorostrymon s. simaethis
Chlorostrymon telea
Calycopis beon
Tmolus echion echiolus
Tmolus azia
Callophrys miserabilis
Strymon melinus
Strymon yojoa
Strymon columella istapa
Strymon bazochii
Hemiargus ceraunus zachaeina
Hemiargus i. isola
Everes c. comyntas
Leptotes cassius striata
Celastrina argiolus gozora

the north.

Second, of the 133 genera found in the Sierra, 58 (44%) have been recorded in the United States (reference; dos Passos, 1964). These, in addition to the number of species represented in the Sierra, the United States, and the relative number found within the Neotropical regions, are listed in Table VI. An analysis of the data presented in this table reveals that of the 58 genera, only 19 (33%) are represented by a greater number of species in the United States than in the Sierra, and that of these 19, only four (7%)-- Colias (Pieridae), Polygonia (Nymphalidae), Vanessa (Nymphalidae), and Callophrys (Lycaenidae)-- have a greater representation in the United States (Nearctic region) than in the entire Neotropical region. Lacking additional information, one may assume with some justification that the center of origin of a genus corresponds to the area containing the greatest number of species (Savage, 1958). Thus, I conclude that at least four genera of the 133 (3%) represented in the Sierra probably have Nearctic origins or at least have their greatest affinities with Nearctic forms and that the remaining genera (129, 97%) probably have Neotropical origins or have their greatest affinities with Neotropical forms.

Third, an analysis of the 37 species (excluding new, endemic species) that have not been recorded from the Sierra according to Hoffmann (1940)-- 10 range extensions within the state of Veracruz, 18 new state listings, and nine new national listings (Table VII)-- reveals that 76% of the new listings (all but the 10 intrastate range extensions) are species with known distributions that

TABLE VI

COMPARISON OF BUTTERFLY GENERA COMMON TO THE SIERRA DE TUXTLA, THE UNITED STATES, AND THE NEOTROPICAL REGIONS

Genus (and family)	No. of species in the Sierra de Tuxtla	No. of species in the United States	Relative no. of species in the Neotropical regions as compared to the Nearctic regions
Papilionidae			
Graphium	7	1	greater
Battus	3	2	greater
Parides	6	1	greater
Papilio	5	21	greater
Pieridae			
Dismorphia	6	1	greater
Appias	1	1	greater
Ascia	1	2	greater (4)
Colias	1	16	lesser
Anteos	2	2	same (2)
Phoebis	7	6	greater
Eurema	11	10	greater
Nathalis	1	1	same (1)
Danaidae			
Danaus	3	3	same (3)
Lycorea	1	1	greater
Satyridae			
Euptychia	15	9	greater
Nymphalidae			
Dryadula	1	1	same (1)
Agraulis	1	1	same (1)
Dryas	1	1	same (1)
Heliconius	11	2	greater

TABLE VI (continued)

Genus (and family)	No. of species in the Sierra de Tuxtla	No. of species in the United States	Relative no. of species in the Neotropical regions as compared to the Nearctic regions
Nymphalidae (continued)			
Euptoieta	1	2	greater (3)
Chlosyne	5	29	greater
Thessalia	1	2	greater (?)
Phyciodes	10	11	greater
Polygonia	1	10	lesser
Vanessa	1	4	lesser
Junonia	1	2	greater
Anartia	2	2	greater
Hypanartia	2	1	greater
Biblis	1	1	same (1)
Mestra	1	2	same (2)
Myscelia	2	2	greater
Eunica	1	2	greater
Diaethria	2	2	greater
Dynamine	2	1	greater
Hamadryas	6	4	greater
Marpesia	4	4	greater
Limenitis	9	7	greater
Chlorippe	3	1	greater
Historis	1	2	same (2)
Smyrna	1	1	greater
Anaea	11	5	greater
Libytheana	1	2	greater
Lycaenidae			
Eumaeus	2	2	greater (3)
Chlorostrymon	2	3	greater
Calycopis	4	2	greater
Tmolus	3	2	greater
Callophrys	7	24	lesser
Atlides	1	1	greater
Panthiades	1	1	greater
Strymon	6	12	greater
Thecla	47	2	greater
Hemiargus	3	3	greater
Everes	1	1	greater (?)

TABLE VI (continued)

Genus (and family)	No. of species in the Sierra de Tuxtla	No. of species in the United States	Relative no. of species in the Neotropical regions as compared to the Nearctic regions
Lycaenidae (continued)			
Leptotes	1	2	greater
Celastrina	1	1	same (1)
Riodinidae			
Euselasia	6	1	greater
Calephelis	3	9	greater
Emesis	4	2	greater

TABLE VII

NEW BUTTERFLY RECORDS FOR THE SIERRA DE TUXTLA (EXCLUDING ENDEMICS)

Species	Nearest Previous Recorded Locale	Associated Plant Formations
I. Intrastate range extensions		
Graphium branchus (Papilionidae)	Sierra Madre Oriental (Veracruz)	Semi-Evergreen Seasonal Forest
Graphium belesis (Papilionidae)	Sierra Madre Oriental (Veracruz)	Semi-Evergreen Seasonal Forest
Graphium agesilaus neosilaus (Papilionidae)	Sierra Madre Oriental (Veracruz)	No specific formation
Dismorphia euryope (Pieridae)	Sierra Madre Oriental (Veracruz)	Montane Thicket, Elfin Woodland
Hamadryas g. guatemalena (Nymphalidae)	Sierra Madre Oriental (Veracruz)	Unrestricted
Prepona brooksiana (Nymphalidae)	Coatepec, Veracruz	Montane Thicket
Eumaeus debora (Lycaenidae)	Sierra Madre Oriental (Veracruz)	Montane Rain Forest, Montane Thicket, Elfin Woodland
Chlorostrymon s. simaethis (Lycaenidae)	Sierra Madre Oriental (Veracruz)	Hedgerows
Electrostrymon cyphara (Lycaenidae)	Sierra Madre Oriental (Veracruz)	Lower Montane Rain Forest, Semi-Evergreen Seasonal Forest
Thecla hecate (Lycaenidae)	Sierra Madre Oriental (Veracruz)	Pastures

TABLE VII (continued)

Species	Nearest Previous Recorded Locale	Associated Plant Formations
II. New state records		
Taygetes kerea (Satyridae)	Chiapas, Sierra Madre del Sur (México)	Deciduous Woodland and the Pinus-Quercus Associes
Phyciodes griseo-basolis (Nymphalidae)	Chiapas (México)	Recently Abandoned Milpas, Pastures
Catagramma lyca (Nymphalidae)	Tabasco, Chiapas, Oaxaca (México)	Lower Montane Rain Forest
Limenitis erotia (Nymphalidae)	Chiapas (México)	Pastures
Limenitis sentia (Nymphalidae)	Yucatán (México)	Swamp Forest, Pastures
Anaea proserpina (Nymphalidae)	Chiapas (México)	Montane Thicket, Elfin Woodland
Strymon melinus (Lycaenidae)	Oaxaca (México)	Pinus-Quercus Associes of the Deciduous Woodland
Thecla thales (Lycaenidae)	Chiapas (México)	Liquidambar-Quercus Associes of the Montane Rain Forest
Thecla denarius (Lycaenidae)	Tabasco (México)	Pinus-Quercus Associes of the Deciduous Woodland
Thecla tera (Lycaenidae)	Chiapas (México)	Lower Montane Rain Forest
Thecla politus (Lycaenidae)	Pacific coast of México	Montane Rain Forest
Perophthalma tullius lasius (Riodinidae)	Chiapas (México)	Liquidambar-Quercus Associes of the Montane Rain Forest

TABLE VII (continued)

Species	Nearest Previous Recorded Locale	Associated Plant Formations
II. New state records (continued)		
Leucochimona v. vestalis (Riodinidae)	Chiapas (México)	Lower Montane Rain Forest, Montane Rain Forest
Isapis agyrtus hera (Riodinidae)	Chiapas (México)	Pinus-Quercus Associes of the Deciduous Woodland
Calephelis sp. 2 (Riodinidae)	Tabasco (México)	Recently Abandoned Milpas, Pastures, Hedgerows
Calydna venusta (Riodinidae)	Oaxaca (México)	Semi-Evergreen Seasonal Forest
Emesis lupina (Riodinidae)	Guerrero (México)	Semi-Evergreen Seasonal Forest
Polystichtis sudias (Riodinidae)	Tabasco (México)	Liquidambar-Quercus Associes of the Montane Rain Forest, Montane Rain Forest
III. New national records		
Epiphile plutonia (Nymphalidae)	Guatemala	Montane Thicket
Limenitis oberthuri (Nymphalidae)	Guatemala	Lower Montane Rain Forest
Calycopis pisis (Lycaenidae)	Guatemala	Liquidambar-Quercus Associes of the Montane Rain Forest
Thecla ares (Lycaenidae)	Guatemala	Recently Abandoned Milpas
Thecla mulucha (Lycaenidae)	Guatemala	Semi-Evergreen Seasonal Forest

TABLE VII (continued)

Species	Nearest Previous Recorded Locale	Associated Plant Formations
III. New national records (continued)		
Thecla ambrax (Lycaenidae)	Nicaragua	Hedgerows
Thecla dodava (Lycaenidae)	Panamá	Montane Rain Forest
Thecla tamos (Lycaenidae)	Costa Rica	Deciduous Woodland, Montane Rain Forest
Theope eleutho (Riodinidae)	Panamá	Pastures, Pinus-Quercus Associes of the Deciduous Woodland

are farther south than the Sierra. The remaining percentage (24%) of new listings, representing ten species, are of species with distributions that are only slightly farther north than the Sierra. These ten species belong to genera that probably have nad Neotropical origins.

In summary, I conclude that the butterfly fauna of the Sierra de Tuxtla is essentially tropical.

ENDEMISM

Following the Tertiary uplift of the Sierra de Tuxtla, the area has been subjected to relatively few physical disturbances. Other than several volcanic eruptions, ash falls, and lava flows, the flora has had a considerable span of time in which to develop and mature. Even during the relatively cool periods of the Pliocene and Pleistocene the proximity of the Gulf of Mexico with its warm, moist winds, probably caused a relatively small decrease in the Sierra's average yearly temperature (Dorf, 1959). However, during that period a slight shift in floral (and faunal) elements conceivably took place; specifically, an extension of the previously minor subtropical elements (Griscom, 1932, 1950) and possibly even the establishment of new immigrants from more northern areas. Subsequent to the Pleistocene, the climate has ameliorated, which in turn has caused the retreat of the subtropical floral elements to relatively high elevations of the major volcanoes (and possibly the elimination of some forms) and the expansion once again of the

more tropical elements (see Griscom, 1932, 1950). Today these latter predominate. Thus, since the Pleistocene relatively stable conditions have existed in the Sierra and there probably have been no major modifications in the flora and fauna by physical elements except minor volcanic disturbances and hurricanes-- both of which have been relatively rare in occurrence. This stability in environment combined with geographic isolation make the area ideally suited for endemism both in flora and fauna. Firschein and Smith (1956) state that at least eight endemic forms of amphibians and reptiles have been reported from the range. Wetmore (1943) listed five birds and Lowery & Newman (1949) one additional bird endemic to the Sierra.

My investigations of the butterfly fauna revealed five endemic forms: three species, one subspecies, and one form (two of the species and the one subspecies still remain undescribed). These endemics are listed in Table VIII. The majority of these forms (four species, 80%) belong to the families lycaenidae and Riodinidae, many members of which are known to have fairly restricted distributions. Furthermore, of these five endemics two occur in the high montane forests (Upper Tropical Zone) and three in the Lower Tropical Zone (Arid Lower Tropical Subzone). All endemics but one (Callophrys nr. longula) belong to genera that never have been recorded within the United States and which I conclude have had Neotropical origins.

TABLE VIII

BUTTERFLIES ENDEMIC TO THE SIERRA DE TUXTLA

Species	Endemic Form	Associated Plant Formations
Morpho theseus justiceae form schwezeri (Nymphalidae)	Form (but probably good subspecies)	Montane Rain Forest, Montane Thicket, Elfin Woodland
Callophrys nr. longula (Lycaenidae)	Species	Elfin Woodland
Thecla nr. antincus (Lycaenidae)	Species	Swamp Forest
Anatole rossi (Riodinidae)	Species	Pinus-Quercus Associes of the Deciduous Woodland
Theope eleutho n. spp. (Riodinidae)	Subspecies	Pinus-Quercus Associes of the Deciduous Woodland, Pastures

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APPENDICES

Appendix A

CHECK-LIST OF BUTTERFLY SPECIES COLLECTED IN THE SIERRA DE TUXTLA

FAMILY PAPILIONIDAE

SUBFAMILY Papilioninae

TRIBE Graphiini

SUBTRIBE Graphiiti

1. Graphium phaon (Boisduval)
2. Graphium branchus (Doubleday)
3. Graphium belesis (Bates)
4. Graphium philolaus (Boisduval)
5. Graphium epidaus epidaus (Doubleday, Westwood, & Hewitson)
6. Graphium agesilaus neosilaus (Hoffer)
7. Graphium calliste calliste (Bates)

TRIBE Troidini

SUBTRIBE Battiti

8. Battus polydamas (Linnaeus)
9. Battus belus varus (Kollar)
10. Battus laodamas copanae (Reakirt)

SUBTRIBE Troiditi

11. Parides photinus (Doubleday)
12. Parides montezuma (Westwood)
13. Parides polyzelus polyzelus (Felder)
14. Parides sesostris zestos (Gray)
15. Parides iphidamas (Fabricius)
16. Parides arcas mylotes (Bates)

TRIBE Papilionini

17. Papilio polyxenes asterius Stoll

18. Papilio thoas autocles Rothschild & Jordan
19. Papilio androgeus epidaurus Godman & Salvin
20. Papilio anchisiades idaeus Fabricius
21. Papilio victorinus victorinus Doubleday

FAMILY PIERIDAE

SUBFAMILY Dismorphiinae

22. Dismorphia (Dismorphia) praxinoe (Doubleday)
23. Dismorphia (Dismorphia) fortunata (Lucas)
24. Dismorphia (Dismorphia) euryope (Lucas)
25. Dismorphia (Acmepteron) nemesis (Latreille)
26. Dismorphia (Enantia) albania (Bates)
27. Dismorphia (Enantia) jethys (Boisduval)

SUBFAMILY Pierinae

28. Catasticta nimbice nimbice (Boisduval)
29. Archonias (Archonias) tereas (Hubner)
30. Appias (Glutophrissa) drusilla poeyi (Butler)
31. Leptophobia aripa elodia (Boisduval)
32. Itaballia (Itaballia) demophile calydonia (Boisduval)
33. Itaballia (Itaballia) pisonis kicaha (Reakirt)
34. Itaballia (Pieriballia) viardi viardi (Boisduval)
35. Ascia (Ascia) monuste monuste (Linnaeus)
36. Melete isandra (Boisduval)

SUBFAMILY Coliadinae

37. Colias (Zerene) cesonia (Stoll)
38. Anteos clorinde (Godart)
39. Anteos maerula (Fabricius)
40. Phoebis (Phoebis) sennae marcellina (Cramer)
41. Phoebis (Phoebis) philea (Johansson)
42. Phoebis (Phoebis) argante (Fabricius)
43. Phoebis (Phoebis) agarithe maxima (Neumoegen)
44. Phoebis (Phoebis) intermedia Butler
45. Phoebis (Rhabdodryas) trite (Linnaeus)
46. Phoebis (Aphrissa) statira jada (Butler)
47. Eurema (Eurema) albula (Cramer)
48. Eurema (Eurema) daira daira (Godart)
49. Eurema (Eurema) boisduvaliana Felder & Felder
50. Eurema (Eurema) xanthochlora (Kollar)
51. Eurema (Eurema) mexicana (Boisduval)
52. Eurema (Eurema) salome (Felder)
53. Eurema (Pyrisitia) proterpia (Fabricius)
54. Eurema (Pyrisitia) lisa Boisduval & Le Conte

55. Eurema (Pyrisitia) nise nelphe (Felder)
56. Eurema (Pyrisitia) dina westwoodi (Boisduval)
57. Eurema (Abaeis) nicippe (Cramer)
58. Nathalis iole Boisduval

FAMILY ITHOMIIDAE

SUBFAMILY Ithomiinae

TRIBE Tithoreini

59. Tithorea harmonia salvadoris Staudinger

TRIBE Melinaeini

60. Melinaea lilis imitata Bates

TRIBE Mechanitini

61. Mechanitis polymnia lycidice Bates
62. Mechanitis agaensis doryssus Bates
63. Mechanitis menapis saturata Godman

TRIBE Napeogenini

64. Hypothyris lycaste dionaea Hewitson
65. Napeogenes tolosa (Hewitson)

TRIBE Ithomiini

66. Ithomia leila Hewitson
67. Ithomia patilla Staudinger

TRIBE Oleriini

68. Hyposcada virginiana virginiana (Hewitson)
69. Oleria zea (Hewitson)
70. Oleria paula (Weymer)
71. Aeria pacifica Godman & Salvin

TRIBE Dircennini

72. Dircenna klugi (Geyer)
73. Episcada artena (Hewitson)
74. Pteronymia cottyto (Guérin)

TRIBE Godyridini

75. Greta nero (Hewitson)
76. Greta oto (Hewitson)
77. Greta anetta (Guérin)
78. Hypoleria cassotis (Bates)

FAMILY DANAIDAE

SUBFAMILY Danainae

79. Danaus (Danaus) plexippus plexippus (Linnaeus)
80. Danaus (Tasitia) gilippus strigosus (Bates)
81. Danaus (Tasitia) eresimus montezuma Talbot

SUBFAMILY Lycoreinae

82. Lycorea ceres atergatis (Doubleday)

FAMILY SATYRIDAE

SUBFAMILY Satyrinae

83. Pierella luna heracles Boisduval
84. Taygetes mermeria excauata Butler
85. Taygetes virgilia (Cramer)
86. Taygetes andromeda (Cramer)
87. Taygetes keneza Butler
88. Taygetes kerea Butler
89. Euptychia gemma freemani (Stalings & Turner)
90. Euptychia hesione (Sulz)
91. Euptychia metaleuca (Boisduval)
92. Euptychia mollina Hübner
93. Euptychia labe Butler
94. Euptychia similis Butler
95. Euptychia themis Butler
96. Euptychia undina Butler
97. Euptychia disaffecta Butler & Druce
98. Euptychia hermes sosybius (Fabricius)
99. Euptychia gigas Butler
100. Euptychia libye (Linnaeus)
101. Euptychia glaucina Bates
102. Euptychia sericella Bates
103. Euptychia nr. alcinoe Felder
104. Pedaliodes pisonia circumducta (Thieme)
105. Dioriste tauropolis (Doubleday & Hewitson)

SUBFAMILY Brassolinae

106. Opsiphanes (Opsiphanes) boisduvalii Westwood & Hewitson
107. Opsiphanes (Opsiphanes) cassiae castaneus Stichel
108. Eryphanis aesacus (Herrich-Schaeffer)
109. Caligo memnon (Felder)
110. Caligo uranus Herrich-Schaeffer

FAMILY NYMPHALIDAE

SUBFAMILY Amathusiinae

TRIBE Morphini

111. Morpho theseus justiciae Salvin & Godman
112. Morpho polyphemus luna Butler
113. Morpho peleides montezuma Guenée

SUBFAMILY Acraeinae

TRIBE Acraeini

114. Actinote leucomelas (Bates)
115. Actinote guatemalena veraecruzis Jordan

SUBFAMILY Heliconiinae

116. Philaethria dido dido (Clerck)
117. Dryadula phaetusa (Linnaeus)
118. Agraulis vanillae incarnata (Riley)
119. Dione juno huascama (Reakirt)
120. Dione moneta poeyii (Butler)
121. Dryas julia moderata (Stichel)
122. Heliconius (Eueides) cleobaea zorcaon (Reakirt)
123. Heliconius (Semelia) vibilia vialis (Stichel)
124. Heliconius (Semelia) lineata (Salvin & Godman)
125. Heliconius (Semelia) aliphera gracilis (Stichel)
126. Heliconius (Heliconius) ismenius telchinia Doubleday
127. Heliconius (Heliconius) doris transiens Staudinger
128. Heliconius (Heliconius) sapho leuce Doubleday
129. Heliconius (Heliconius) sara veraepacis Bates
130. Heliconius (Heliconius) petiveranus Doubleday
131. Heliconius (Heliconius) charitonius vazquezae Comstock & Brown
132. Heliconius (Heliconius) hortense Guerin

SUBFAMILY Nymphalinae

TRIBE Argyniddidi

133. Euptoieta hegesia hoffmanni Comstock
134. Chlosyne janais (Drury)
135. Chlosyne hippodrome (Geyer)
136. Chlosyne lacinia lacinia (Geyer)
137. Chlosyne erodyle (Bates)
138. Chlosyne definita Aaron
139. Thessalia theona theona (Ménétriés)
140. Phyciodes (Phyciodes) vesta (Edwards)
141. Phyciodes (Eresia) frisia tulcis (Bates)
142. Phyciodes (Eresia) claudina guatemalena (Bates)
143. Phyciodes (Eresia) phillyra (Hewitson)
144. Phyciodes (Tritanassa) atronia (Bates)
145. Phyciodes (Tritanassa) ardys ardys Hewitson
146. Phyciodes (Tritanassa) eranites mejicana (Roeber)

147. Phyciodes (Tritanassa) myia (Hewitson)
148. Phyciodes (Tritanassa) griseobasalis Roeber
149. Phyciodes (Tritanassa) clara (Bates)

TRIBE Nymphalini

150. Polygonia g-argenteum (Doubleday & Hewitson)
151. Vanessa virginiensis (Drury)
152. Junonia evarete evarete (Cramer)
153. Anartia jatrophae luteipicta Fruhstorfer
154. Anartia fatima venusta Fruhstorfer
155. Metamorpha stelenes biplagiata (Fruhstorfer)
156. Metamorpha epaphus (Latreille)
157. Hypanartia lethe (Fabricius)
158. Hypanartia dione Latreille

TRIBE Biblini

159. Biblis hyperia aganisa Boisduval

TRIBE Eunicidi

160. Mestra amymone (Ménétriés)
161. Pyrrhogyra hypensor Godman & Salvin
162. Pyrrhogyra edocla aenaria Fruhstorfer
163. Pyrrhogyra otolais neis Felder
164. Pseudonica flavilla canthara (Doubleday)
165. Temenis laothoe liberia (Fabricius)
166. Epiphile adrasta bandusia Fruhstorfer
167. Epiphile plutonia Bates
168. Catonephele nyctimus (Westwood)
169. Catonephele numilia esite (Felder)
170. Nessaea aglaura (Westwood & Hewitson)
171. Myscelia cyaniris Doubleday & Hewitson
172. Myscelia rogenhoferi Felder
173. Eunica monima (Stoll)
174. Eunica alcmena alcmena Doubleday & Hewitson
175. Catagramma lyca Doubleday & Hewitson
176. Catagramma titania Salvin
177. Catagramma casta Salvin
178. Diaethria anna (Guérin)
179. Diaethria astala (Guérin)
180. Dynamine mylitta (Cramer)
181. Dynamine dyonis Geyer

TRIBE Ageroniidi

182. Hamadryas februa gudula (Fruhstorfer)
183. Hamadryas feronia farinulenta (Fruhstorfer)
184. Hamadryas guatemalena guatemalena (Bates)
185. Hamadryas iphthime (Bates)
186. Hamadryas amphinome mexicana (Lucas)
187. Hamadryas laodamia laodamia (Cramer)

TRIBE Marpesiidi

188. Marpesia chiron (Fabricius)
189. Marpesia harmonia (Klug)
190. Marpesia corita (Westwood)
191. Marpesia petreus (Cramer)

TRIBE Limenitidi

192. Limenitis (Adelpha) melanthe (Bates)
193. Limenitis (Adelpha) leuceria (Druce)
194. Limenitis (Adelpha) erotia (Hewitson)
195. Limenitis (Adelpha) oberthuri (Boisduval)
196. Limenitis (Adelpha) iphicla (Linnaeus)
197. Limenitis (Adelpha) basiloides (Bates)
198. Limenitis (Adelpha) felderi (Boisduval)
199. Limenitis (Adelpha) sentia (Godman & Salvin)
200. Limenitis (Adelpha) paraeca (Bates)

TRIBE Apaturidi

201. Chlorippe cherubina (Felder)
202. Chlorippe pavon (Latreille)
203. Chlorippe laure (Drury)
204. Historis odius (Fabricius)
205. Smyrna blomfildia datis Fruhstorfer
206. Gynaecia dirce (Linnaeus)

TRIBE Charaxidi

207. Prepona demophon centralis Fruhstorfer
208. Prepona antimache gulina Fruhstorfer
209. Prepona amphimachus (Fabricius)
210. Prepona laertes pallantias Fruhstorfer
211. Prepona brooksiana Godman & Salvin
212. Anaea (Siderone) marthesia (Cramer)
213. Anaea (Zaretis) itys (Cramer)
214. Anaea (Zaretis) callidryas (Felder)
215. Anaea (Anaea) aidea Guérin-Ménéville
216. Anaea (Consul) fabius (Cramer)
217. Anaea (Consul) electra (Westwood)
218. Anaea (Memphis) eurypyle confusa Hall
219. Anaea (Memphis) artacaena (Hewitson)
220. Anaea (Memphis) pithyusa (Felder)
221. Anaea (Memphis) proserpina (Salvin)
222. Anaea (Memphis) morvus boisduvali W.P. Comstock

SUBFAMILY Libytheinae

223. Libytheana carinenta mexicana Michener

FAMILY LYCAENIDAE

SUBFAMILY Lycaeninae

TRIBE Theclini

SUBTRIBE Strymoniti

224. Eumaeus minyas Hübner
225. Eumaeus debora Hübner
226. Theorema eumenia Hewitson
227. Chlorostrymon simaethis simaethis (Drury)
228. Chlorostrymon telea (Hewitson)
229. Calycopis beon (Cramer)
230. Calycopis trebula (Hewitson)
231. Calycopis pisis (Godman & Salvin)
232. Calycopis sp. "C"
233. Tmolus echion echiolus (Draudt)
234. Tmolus crolinus (Butler & Druce)
235. Tmolus azia (Hewitson)
236. Oenomaus ortygnus (Cramer)
237. Callophrys (Cyanophrys) amyntor distractus Clench
238. Callophrys (Cyanophrys) herodotus (Fabricius)
239. Callophrys (Cyanophrys) leucania (Hewitson)
240. Callophrys (Cyanophrys) miserabilis (Clench)
241. Callophrys (Cyanophrys) goodsoni Clench
242. Callophrys (Cyanophrys) agricolor agricolor (Butler & Druce)
243. Callophrys (Cyanophrys) nr. longula (Hewitson)
244. Atlides polybe (Linnaeus)
245. Panthiades ochus (Godman & Salvin)
246. Strymon melinus Hubner
247. Strymon yojoa (Reakirt)
248. Strymon columella istapa (Reakirt)
249. Strymon bazochii (Godart)
250. Strymon albata sedecia (Hewitson)
251. Strymon serapio (Godman & Salvin)
252. Electrostrymon cyphara (Hewitson)
253. Cycnus battus jalan (Reakirt)
254. Arawacus aetolus togarna (Hewitson)
255. Arawacus sito (Boisduval)
256. Heterosmaitia palegon (Cramer)
257. Allosmaitia pion (Godman & Salvin)
258. Evenus regalis (Cramer)
259. Thecla cypria (Geyer)
260. Thecla marsyas damo (Druce)
261. Thecla augustula Kirby
262. Thecla lisus Stoll
263. Thecla mavors (Hübner)
264. Thecla inachus carpophora Hewitson
265. Thecla neora Hewitson
266. Thecla laothoe Godman & Salvin
267. Thecla barajo Reakirt

268. Thecla janias (Cramer)
269. Thecla hassan (Stoll)
270. Thecla meton (Cramer)
271. Thecla janthina janthodonia Dyar
272. Thecla nr. polibites (Cramer)
273. Thecla vibidia Hewitson
274. Thecla hecate Godman & Salvin
275. Thecla jebus (Godart)
276. Thecla brescia Hewitson
277. Thecla ligurina Hewitson
278. Thecla mycon Godman & Salvin
279. Thecla thales (Fabricius)
280. Thecla tephraeus (Geyer)
281. Thecla syncellus syncellus (Cramer)
282. Thecla minthe Godman & Salvin
283. Thecla empusa Hewitson
284. Thecla ares Godman & Salvin
285. Thecla ahola Hewitson
286. Thecla gabatha Hewitson
287. Thecla tarpa Godman & Salvin
288. Thecla maeonis Godman & Salvin
289. Thecla hesperitis (Butler & Druce)
290. Thecla denarius (Butler & Druce)
291. Thecla plusios Godman & Salvin
292. Thecla clarina Hewitson
293. Thecla demonassa Hewitson
294. Thecla tera Hewitson
295. Thecla coronata Hewitson
296. Thecla scopas Godman & Salvin
297. Thecla mathewi Hewitson
298. Thecla politus Druce
299. Thecla basalides (Geyer)
300. Thecla mulucha Hewitson
301. Thecla ambrax Westwood & Hewitson
302. Thecla dodava Hewitson
303. Thecla kalikimaka Clench
304. Thecla tamos Godman & Salvin
305. Thecla nr. antincus Felder

TRIBE Plebejini

306. Hemiargus (Hemiargus) ceraunus zachaeina (Butler & Druce)
307. Hemiargus (Echinargus) huntingtoni hannoides Clench
308. Hemiargus (Echinargus) isola isola (Reakirt)
309. Everes comyntas comyntas (Godart)
310. Leptotes cassius striata (Edwards)
311. Celastrina argiolus gozora (Boisduval)

FAMILY RIODINIDAE

SUBFAMILY Euselasiinae

TRIBE Euselasiini

312. Euselasia sergia (Godman & Salvin)
313. Euselasia hieronymi (Godman & Salvin)
314. Euselasia cheles aurantiaca (Godman & Salvin)
315. Euselasia cataleuca (Felder)
316. Euselasia pusilla (Felder)
317. Euselasia eubule (Felder)

SUBFAMILY Riodininae

TRIBE Riodinini

318. Hades noctula Westwood
319. Perophthalma tullius lasius Stichel
320. Leucochimona philemon nivalis (Godman & Salvin)
321. Leucochimona vestalis vestalis (Bates)
322. Mesosemia tetrica Stichel
323. Mesosemia gaudiolus Bates
324. Eurybia lycisca Westwood
325. Cremna umbra (Boisduval)
326. Ancylusis jurgensenii (Saunders)
327. Rhetus arcius thia (Morisse)
328. Isapis agyrtus hera Godman & Salvin
329. Notheme eumeus diadema Stichel
330. Calephelis fulmen (Stichel)
331. Calephelis sp. 1
332. Calephelis sp. 2
333. Charis velutina (Godman & Salvin)
334. Charis myrtea (Godman & Salvin)
335. Charis psaros (Godman & Salvin)
336. Charmona gynaea zama (Bates)
337. Baeotis hisbon zonata Felder
338. Lymnas pixe pixe Boisduval
339. Mesene margaretta (White)
340. Mesene croceela Bates
341. Symmachia rubina Bates
342. Symmachia accustrix Westwood
343. Symmachia tricolor hedemanni (Felder)
344. Phaenochitonia sagaris tyriotes (Godman & Salvin)
345. Anteros carausius carausius Westwood
346. Calydna venusta Godman & Salvin
347. Emesis liodes Godman & Salvin
348. Emesis mandana mandana (Cramer)
349. Emesis tenedia Felder
350. Emesis lupina Godman & Salvin
351. Tharops menander isthmiae Godman & Salvin
352. Thisbe irenea belides Stichel

353. Polystichtis sudias (Hewitson)
354. Anatole agave (Godman & Salvin)
355. Anatole rossi Clench
356. Peplia lamis melpe (Hubner)
357. Nymula calice mycone (Hewitson)
358. Calociasma lilina (Butler)

TRIBE Theopini

359. Theope eleutho Godman & Salvin n. ssp.

Appendix B

PLANTS IDENTIFIED FROM THE SIERRA DE TUXTLA

Acanthaceae
- Aphelandra aurantiaca (Schiedw.) Lindl.
- Odontonema callistachyum (S. & C.) Kuntze
- Ruellia fluviatilis Leonard

Amaryllidaceae
- Agave sp.

Anacardiaceae
- Spondias mombin L.

Annonaceae
- Annona muricata L.
- Annona reticulata L.
- Annona sp.

Apocynaceae
- Stemmadenia galeottiana (A. Rich.) Miers.
- Tabernaemontana citrifolia L.

Aquifoliaceae
- Ilex belizensis Lundell
- Ilex discolor Hemsl.
- Ilex nitida (Vahl.) Maxim.

Araliaceae
- Dendropanax arboreus (L.) D. & P.
- Oreopanax capitatum (Jacq.) D. & P.
- Oreopanax xalapense (H.B.K.) D. & P.

Aristolochiaceae
- Aristolochia asclepiadifolia T.S. Brandeg.

Asclepiadaceae
- Asclepias woodsoniana Standl. & Steyerm.

Aspidieae
- Didymochlaena truncatula (Swartz) J. Smith

Bombacaceae
- Bernoullia flammea Oliver
- Ceiba pentandra (L.) Gaertn.
- Pachira aquatica Aubl.

Boraginaceae
Cordia alliodora (R. & P.) Cham.
Cordia spinescens L.
Heliotropium indicum L.
Tournefortia glabra L.

Burseraceae
Bursera simaruba (L.) Sarg. sens. lat.

Campanulaceae
Centropogon affine Mart. & Gal.

Caprifoliaceae
Viburnum acutifolium Benth.

Clethraceae
Clethra macrophylla M. & G.
Clethra suaveolens Turcz.

Combretaceae
Terminalia amazonia (Gmel.) Exell.

Compositae
Ageratum conyzoides L.
Baltimora recta L.
Bidens pilosa L. var. *bimucronata* (Turcz.) Schultz
Calea cacosmoides Less. (tentative)
Calea longipedicellata R. & G.
Calea zacatechichi Schlecht.
Conyza chilensis Spreng.
Eupatorium incomptum DC.
Eupatorium macrophyllum L.
Eupatorium pittieri Klatt
Eupatorium tuerckheimii Klatt, vel aff. (tentative)
Hidalgoa ternata Llave
Liabum dimidium Blake (tentative)
Liabum sp.
Melampodium divaricatum (Rich.) DC.
Melampodium kunthianum DC.
Melanthera angustifolia A. Rich.
Polymnia maculata Cav.
Schistocarpha sp.
Senecio sp.
Stevia rhombifolia (H.B.K.)
Vernonia argyropappa Buek.
Vernonia leiocarpa DC.

Convolvulaceae
Ipomoea pes-caprae (L.) Sweet
Ipomoea stolonifera (Cyr.) Gmel.

Corylaceae
Carpinus caroliniana Walt.

Cucurbitaceae
Anguria tabascensis Donn. Sm., vel aff.

Cycadaceae
Ceratozamia mexicana Brongn. sens. lat.
Zamia loddigesii var. *angustifolia* (Regel) Schuster

Cyatheaceae
Alsophila schiedeana Presl.
Cyathea sp.

Cyperaceae
Bulbostylis papillosa Kukenth. (tentative)
Cyperus articulatus L.
Cyperus ligularis L.
Dichromena ciliata Vah.
Rhynchospora globosa (H.B.K.) R. & S.
Rhynchospora tuerckheimii Clarke

Dilleniaceae
Curatella americana L.
Saurauia sp.

Elaeocarpaceae
Sloanea sp.

Ericaceae
Gaultheria sp. (tentative)

Erythroxylaceae
Erythroxylon tabascense Britton

Euphorbiaceae
Acalypha diversifolia Jacq. var. *carpinifolia* (Poepp. & Endl.) Muell.-Arg.
Acalypha unibracteata Muell.-Arg., vel aff.
Alchornea latifolia Sw.
Croton glabellus L.
Croton repens Schlecht.
Croton soliman Schlecht. & Cham.
Gymnanthes actinostemoides Muell.-Arg.
Jatropha curcas L., vel aff.
Rondelitia galeottii Standl., vel aff.

Fabaceae
Dussia mexicana (Standl.) Harms
Erythrina americana Mill.
Gliricidea sepium (Jacq.) Steud.

Fagaceae
- Quercus conspersa Benth.
- Quercus ghiesbreghtii Mart. & Gal., vel aff.
- Quercus oleoides S. & C.
- Quercus peduncularis Née, vel aff.
- Quercus skinneri Benth.

Flacourtiaceae
- Casearia nitida (L.) Jacq.
- Casearia sylvestris Sw.
- Pleuranthodendron mexicana (A. Gray) L. Wms.
- Xylosma sp.

Gleicheniaceae
- Gleichenia palmata (Schaffner) Moore

Gramineae
- Aulonemia sp.
- Cenchrus incertus M.A. Curtis
- Chloris petraea Swartz
- Distichlis spicata (L.) Greene (tentative)
- Eragrostis sp.
- Isachne arundinacea (Sw.) Griseb.
- Paspalum pectinatum Nees
- Paspalum plicatulum Michx.
- Sporobolus cubensis Hetchc.

Guttiferae
- Clusia salvinii Donn. Sm.
- Rheedia edulis (Seem.) Tr. & Pl.
- Vismia mexicana Schlecht.

Hamamelidaceae
- Liquidambar styraciflua L.

Icacinaceae
- Calatola sp.

Juglandaceae
- Engelhardtia guatemalensis Standl.
- Engelhardtia mexicana Standl.

Labiatae
- Salvia shannonii Donn. Sm.

Lauraceae
- Persea longipes (Schlecht.) Meissn.
- Phoebe bourgeauviana Mez
- Phoebe mexicana Meissn.
- Phoebe psychotrioides (Nees) Mez (tentative)

Leguminosae
- Albizia idiopoda (Blake) B. & R.
- Albizia sp.
- Calliandra grandiflora (L'Her.) Benth.
- Cassia fruticosa Mill. (tentative)
- Cassia hispidula Vahl
- Cassia occidentalis L.
- Cassia spectabilis DC., vel aff.
- Crotalaria vitellina Ker
- Dalbergia sp. (tentative)
- Erythrina mexicana Krukoff
- Inga leptoloba Schlecht.
- Inga spuria Humb. & Bonpl.
- Pithecollobium arboreum (L.) Urb.
- Vigna luteola (Jacq.) Benth. (tentative)

Magnoliaceae
- Talauma mexicana (DC.) G. Don

Malpighiaceae
- Byrsonima crassifolia (L.) DC.

Malvaceae
- Hibiscus tiliaceus L.

Melastomaceae
- Conostegia xalapensis (Bonpl.) DC.
- Miconia argentea (Sw.) DC.
- Miconia glaberrima (Schlecht.) Naud.

Melioceae
- Guarea sp. (tentative)

Meteoriaceae
- Pilotrichella flexilis (Hedw.) Jaeg.

Monimiaceae
- Siparuna andina (Tul.) A. DC.

Moraceae
- Cecropia mexicana Hemsl.
- Ficus cotinifolia H.B.K.
- Ficus glaucescens (Liebm.) Miq.
- Ficus obtusifolia H.B.K.
- Ficus padifolia H.B.K.
- Ficus spp.
- Pseudolmedia oxyphyllaria Donn. Sm.

Musaceae
- Heliconia latispatha Benth.

Myricaceae
- Myrica cerifera L.
- Myrica splendens (Sw.) DC.

Myristicaceae
- Virola guatemalensis (Hemsl.) Warb.

Myrsinaceae
- Ardisia sp. (tentative)
- Deherainia smaragdina (Planch.) Decaisne

Myrtaceae
- Eugenia sp. (tentative)

Orchidaceae
- Elleanthus capitatus (R. Br.) Reichb.

Oxalidaceae
- Oxalis neaei DC. sens lat.

Palmae
- Astrocaryum mexicanum Liebm.
- Chamaedorea elegans Mart. (tentative)
- Chamaedorea ernesti-augustii Wendl. (tentative)
- Chamaedorea tepejilote Liebm.
- Chamaedorea sp.
- Orbignya sp.
- Sabal sp.

Passifloriaceae
- Passiflora ambigua Hemsl.
- Passiflora biflora Lam.
- Passiflora coriacea Juss.
- Passiflora serratifolia L.

Pinaceae
- Pinus oocarpa Schiede

Piperaceae
- Piper auritum H.B.K., vel aff.
- Piper cordovan C. DC., vel aff.
- Piper spp.

Podocarpaceae
- Podocarpus oleifolius D. Don

Polypodiaceae
- Dryopteris sp.
- Pteridium aquilinum var. caudatum (L.) Sadele

Proteaceae
- Roupala borealis Hemsl.

Pterobryaceae
Pterobryum densum (Schwaegr.) Hornsch.

Rhizophoraceae
Rhizophora mangle L.

Rosaceae
Hirtella racemosa Lam.

Rubiaceae
Borreria suaveolens Mey.
Cephaelis elata Sw.
Crusea calcocephala DC.
Deppea excelsa (H.B.K.) Standl., vel aff.
Hamelia longipes Standl.
Hamelia patens Jacq.
Hoffmannia lenticillata Hemsl.
Lindenia rivalis Benth.
Machaonia sp., vel aff. (tentative)
Psychotria padifolia H. & B. (tentative)
Psychotria sp.
Rondeletia strigosa (Benth.) Hemsl.
Rudgea cornifolia (H. & B.) Standl., vel aff.

Rutaceae
Zanthoxylum elephantiasis Macf.

Sapindaceae
Thouinidium decandrum (H. & B.) Radlk.

Saxifragaceae
Weinmannia pinnata L.

Scrophulariaceae
Escobedia laevis C. & S.
Lamourouxia viscosa H.B.K.
Stemodia durantifolia Sw., vel aff. (tentative)

Simaroubaceae
Picramnia andicola Tul., vel aff. (tentative)

Solanaceae
Solanum ochraceo-ferrugineum (Dunal) Fernald
Solanum schlechtendalianum Walp.
Solanum spp.

Theaceae
Saurauia sp. (tentative)

Tiliaceae
Apeiba tibourbous Aubl.
Belotia sp.
Luehea speciosa Willd.

Turneraceae
Turnera ulmifolia L.

Ulmaceae
Mirandaceltis monoica (Hemsl.) Sharp

Urticaceae
Boehmeria sp. (tentative)
Myriocarpa bifurca Liebm. (tentative)
Myriocarpa longipes Liebm.
Trema micrantha (L.) Blume
Urera elata (Sw.) Griseb.

Verbenaceae
Aegiphila costaricensis Moldenke

Violaceae
Rinorea guatemalensis (Wats.) Bartlett

VITA

Gary Noel Ross was born in New Orleans, Louisiana on May 23, 1940. He attended grammar and high schools in the public school system of that city. From September 1958 until June 1961, he attended Louisiana State University in New Orleans, majoring in biology. In June 1961, he transferred to the main campus of Louisiana State University in Baton Rouge, graduating in June 1962 with the degree of Bachelor of Science in zoology. Mr. Ross entered the Graduate School of Louisiana State University in June 1962 and graduated with the degree of Master of Science in entomology in May 1964. He continued his graduate studies at Louisiana State University and is now a candidate for the degree of Doctor of Philosophy in entomology in May 1967.

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Major Field: Entomology

Title of Thesis: A Distributional Study of the Butterflies of the Sierra de Tuxtla in Veracruz, Mexico

Approved:

M. S. Blum
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